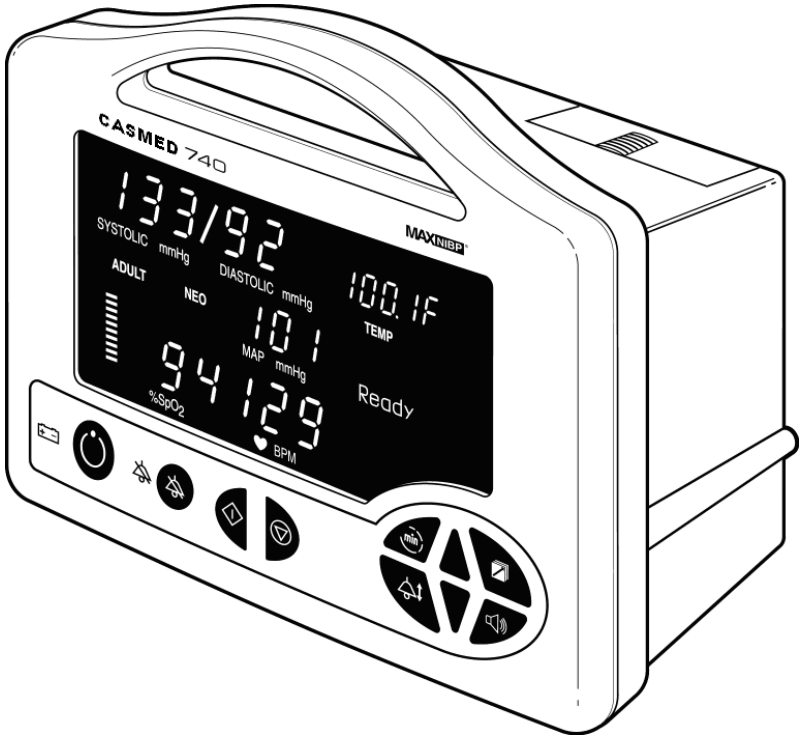
CASMED 740
Vital Signs Monitor



Service Manual

CASMED®
FOR WHAT'S VITAL

CE 0086

21-02-0174 REV. 02 05/08

THE CASMED 740
VITAL SIGNS MONITOR

FEATURES

CASMED 740 - 1 **Non-Invasive Blood Pressure and Pulse Rate.**

CASMED 740 - 2 **Non-Invasive Blood Pressure, Pulse Rate and Pulse Oximeter.**
or
Non-Invasive Blood Pressure, Pulse Rate and Temperature.

CASMED 740 - 3 **Vital Signs Monitor with Non-Invasive Blood Pressure, Pulse Rate, Pulse Oximeter and Predictive Temperature.**

IMPORTANT:

This manual addresses all parameters of the CASMED 740 Vital Signs Monitor. You may have purchased a model that does not have all the parameters referred to in the manual.

THIS MANUAL REMAINS SUITABLE FOR USE!

WARNING:

The CASMED 740 Monitor is to be operated by qualified personnel only. Before use, carefully read this manual, including accessory directions for use, all precautionary information, and specifications. The user must check that the equipment functions safely and see that it is in proper working condition before being used.

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Should service be required, contact the dealer in the country of purchase.

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1. INTRODUCTION AND INTENDED USE

INTRODUCTION

The CASMED 740 Monitor is multi parameter monitor measuring blood pressure, oxygen saturation and temperature. Non-invasive blood pressure is measured using the oscillometric technique determining systolic, diastolic, mean arterial pressure and pulse rate. The pulse oximeter function continuously monitors and displays values for functional arterial hemoglobin saturation and a pulse rate. Temperature is obtained in the normal (predictive) mode in as little as four (4) seconds. A monitoring mode is available for taking axillary temperatures.

BRIEF DEVICE DESCRIPTION

The CASMED 740 Monitor is compact, lightweight and portable, allowing it to be easily carried and used in a variety of clinical settings. The monitor is powered by AC Line Power, +12 VDC or by a Nickel Metal Hydride (NiMH) rechargeable battery pack. The internal battery pack charges when the monitor is plugged into a power source (AC Line Power or +12 VDC). The CASMED 740 Monitor can be set to operate in one of nine (9) different languages: English, German, French, Italian, Spanish, Dutch, Swedish, Portuguese or Norwegian. The message window can display various system alarm messages. These messages direct the user to check conditions such as the battery state, air leaks and measurement problems. The message window also displays the operational mode of the monitor (automatic or manual).

The non-invasive blood pressure (NIBP) parameter automatically inflates an occluding cuff and, using the oscillometric measurement technique, determines systolic, diastolic and mean arterial pressure and pulse rate. Measurement results along with operator prompts and error messages are displayed on the front panel. The frequency of NIBP determination can be selected by the operator in varied times between one and ninety minutes. The auto and manual operating modes cover a variety of clinical uses.

The pulse oximeter parameter (%SpO_2) determines arterial oxyhemoglobin saturation by measuring the absorption of red and infrared light passing through the tissue. Changes in absorption caused by pulsations of blood in the vascular bed are used to determine arterial saturation and pulse rate. The oximeter requires no routine calibration or maintenance. Oxygen saturation and heart rate are displayed on light emitting diode (LED) digital displays. On each detected pulse, the perfusion LED does indicate patient perfusion signals. This bar graph gives the user a pulse-by-pulse visual indication of waveform signal quality. An audio “beep” can be enabled that is generated each time the SpO_2 module detects a pulse.

NOTE:
The bar graph is not proportional to the pulse volume.

The temperature parameter has the capability of taking temperature in either normal (predictive) or monitor mode. In the normal mode, the thermometer’s microprocessor “predicts” body temperature in about four (4) seconds for oral temperatures, about ten (10) seconds for axillary temperatures and in about fifteen (15) seconds for rectal temperatures.

Monitor mode is normally used for longer term monitoring and when difficult situations prevent accurate temperature from being taken in the predictive mode. In monitoring mode, the probe must be in contact with tissue for at least three (3) minutes for accurate oral / rectal temperature measurement and five (5) minutes for accurate axillary temperature measurement.

The default setting used by the CASMED 740 Monitor for temperature determinations is the normal (predictive) mode.

NOTE:
Axillary temperature readings may only be taken in the Neonate monitoring mode.

PATIENT ENVIRONMENT

The CASMED 740 Monitor has been tested with specific parts of the "system" used within the Patient Environment. **Figure 1**, defines the Patient Environment.

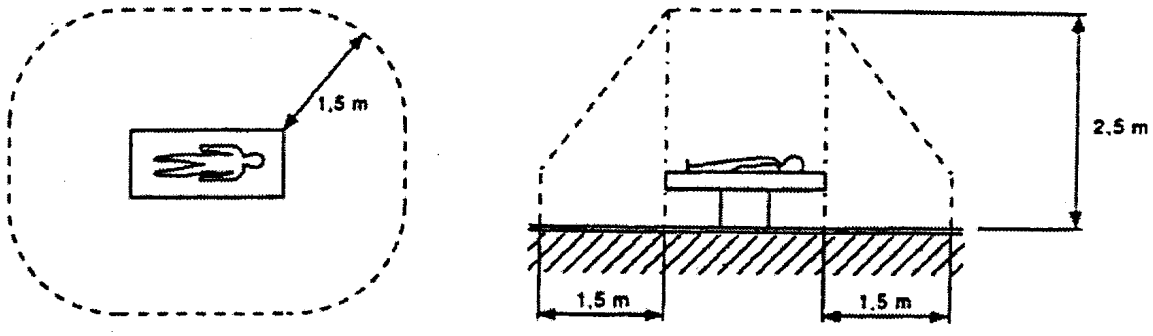

Figure 1: **Patient Environment**

The parts of the CASMED 740 Monitor "system" that can be used in the Patient Environment are defined as;

The CASMED 740 Monitor
Appropriate Accessories, listed in the ACCESSORIES section of the User's Manual
Line Cord
Optional RS232 / Nurse Call Option
Citizen CMP-10 Mobile Printer
RS232 Interconnect Cable (supplied with printer)
AC Adapter / Charger, Model TRC-09-1100-M from Group West or equivalent (supplied with printer)

Table 1: **Parts of the System**

MANUAL INFORMATION

REVISION HISTORY

Each page of this manual has the document part number and revision letter at the bottom of the page. The revision letter identifies the document's update level. The revision history of this document is summarized below.

Revision History		
Revision	**Date**	**Comments**
00	07/2003	Initial Release
01	07/2007	Update artwork and text to CASMED. Add SureTemp Plus
02	05/2008	Update EU AR and trademarks

MANUAL OVERVIEW

This manual contains information for diagnosing and servicing the CASMED 740 Monitor to board level without the necessity of electrical schematics. Only qualified service personnel should service this product.

It is the user's responsibility to ensure that the product is properly maintained and that the monitor is in safe and proper operating condition before being put into use.

Before servicing the CASMED 740 Monitor, read the User's Manual carefully.

CAS Medical Systems, Inc. believes the information herein is complete and accurate, but accepts no liability for errors, omissions, or misrepresentations.

INTENDED AUDIENCE

This manual is intended for service representatives and technical personnel who maintain, troubleshoot, or repair this equipment.

DEFINITION OF TERMS

In this manual, "WARNING", "CAUTION", "IMPORTANT" and "NOTE" mean the following:

WARNING:
Directions that warn of conditions that put the patient or caregiver at risk.

CAUTION:
Directions that help you avoid damaging your monitor or losing data.

IMPORTANT:
Directions you should be particularly aware of; something not readily apparent.

NOTE:
Directions that make it easier to use your monitor.

RELATED DOCUMENTS

To perform test and troubleshooting procedures, you must know how to operate the monitor. Refer to the CASMED 740 Vital Signs Monitor User's Manual.

MONITOR CONFIGURATIONS

CASMED 740-1	MAXNIBP®, 100-240V, 50/60HZ, AC Power Supply and Battery
CASMED 740M-1	MAXNIBP®, 12VDC Power input with Battery, Mount included
CASMED 740-2MS	MAXNIBP® and Masimo SpO_2, 100-240V, 50/60HZ, AC Power Supply and Battery
CASMED 740M-2MS	MAXNIBP® and Masimo SpO_2, 12VDC Power input with Battery, Mount included
CASMED 740-2NL	MAXNIBP® and Nellcor SpO_2, 100-240V, 50/60HZ, AC Power Supply and Battery
CASMED 740M-2NL	MAXNIBP® and Nellcor SpO_2, 12VDC Power input with Battery, Mount included
CASMED 740-2NN	MAXNIBP® and Nonin SpO_2, 100-240V, 50/60HZ, AC Power Supply and Battery
CASMED 740M-2NN	MAXNIBP® and Nonin SpO_2, 12VDC Power input with Battery, Mount included
CASMED 740-2T	MAXNIBP® and Temperature, 100-240V, 50/60HZ, AC Power Supply and Battery
CASMED 740M-2T	MAXNIBP® and Temperature, 12VDC Power input with Battery, Mount included
CASMED 740-3MS	MAXNIBP®, Masimo SpO_2, and Temperature, 100-240V, 50/60HZ, AC Power Supply and Battery
CASMED 740M-3MS	MAXNIBP®, Masimo SpO_2, and Temperature, 12VDC Power input with Battery, Mount included
CASMED 740-3NL	MAXNIBP®, Nellcor SpO_2, and Temperature, 100-240V, 50/60HZ, AC Power Supply and Battery
CASMED 740M-3NL	MAXNIBP®, Nellcor SpO_2, and Temperature, 12VDC Power input with Battery, Mount included
CASMED 740-3NN	MAXNIBP®, Nonin SpO_2, and Temperature, 100-240V, 50/60HZ, AC Power Supply and Battery
CASMED 740M-3NN	MAXNIBP®, Nonin SpO_2, and Temperature, 12VDC Power input with Battery, Mount included

Table 2: **Monitor Configurations**

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2. SERVICE POLICY

WARRANTY POLICY

MONITORS

NOTE:
For all U.S. government accounts please see the Warranty Addendum at www.va.casmed.com.

All products are sold by CAS Medical Systems, Inc. under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this product directly from CAS Medical Systems, Inc. or CAS's Authorized Distributors as new merchandise and are extended to the first buyer thereof, other than for resale.

The CASMED 740 Monitor is warranted for a period of twenty-four (24) months. All products, excluding printers, if applicable, are warranted to be free from functional defects in materials and workmanship and to conform to the description of the product contained in the Operator/Service Manual, published specifications, and accompanying labels and/or inserts, provided that the same is properly operated under conditions of normal use in accordance with applicable safety and regulatory requirements, and that replacements and repairs are made in accordance with the instructions provided by CAS Medical Systems, Inc.

The same warranty conditions are made for a period of twelve (12) months with respect to printer and battery. A ninety (90) days warranty is provided for non-disposable accessories such as reusable SpO_2 sensors, reusable temperature probes and other accessories provided by CAS as part of the original purchase. CAS warrants disposable or single-patient-use products, including blood pressure cuffs, for out-of-box failure only. Reusable blood pressure cuffs are warranted for one year. Where the accessory is not a CAS Medical Systems, Inc. manufactured product, the manufacturer's own warranty applies. Warranty of accessories purchased separately from listed suppliers will be the responsibility of such listed suppliers. Damage to any part through misuse, neglect, or accident, or by affixing any accessories or attachments other than CAS, Statcorp, Masimo®, Nellcor®, Nonin®, and Welch Allyn® manufactured accessories or attachments, is not covered by this warranty.

The foregoing warranties shall not apply if the product has been configured, modified, adjusted or repaired other than by CAS Medical Systems, Inc. or by persons expressly authorized by CAS Medical Systems, Inc., or not in accordance with written instructions provided by CAS Medical Systems, Inc., or if the product has been subjected to misuse, negligence, or accident. This warranty is void if the printer is used with any paper other than that specified by CAS Medical Systems, Inc.

CAS reserves the right to perform warranty service operations in its own factory, at an authorized repair facility, or at the customers' site. CAS Medical Systems, Inc.'s sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties, is limited to repairing or replacing, free of charge, a product which is reported in writing or via telephone to CAS Medical Systems, Inc., has a Return Material Authorization (RMA) number assigned and which is returned during normal business hours, transporting charges prepaid to:

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44 East Industrial Road
Branford, CT. 06405 USA
Telephone: +1 203 488 6056
Fax: +1 203 488 9438
E-mail: custsrv@casmed.com

CAS MEDICAL SYSTEMS, INC. SHALL NOT BE OTHERWISE LIABLE FOR ANY DAMAGES INCLUDING, BUT NOT LIMITED TO, INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES OR SPECIAL DAMAGES.

THERE ARE NO EXPRESS OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREINABOVE SET FORTH. CAS MEDICAL SYSTEMS, INC. MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCT OR PARTS THEREOF.

EXTENDED WARRANTY PROGRAM

CAS Medical Systems offers an Extended Warranty Program for the CASMED 740 Monitor.

A one (1) year Extended Warranty, on the monitor, is available at either the time of purchase or within two (2) years of the purchase date.

Contact CAS Medical Systems' Customer Service Department for more information.

RETURNING THE MONITOR FOR REPAIR

Before returning a product for repair you must obtain authorization from CAS Medical Systems. An RMA (Return Materials Authorization) number will be given to you by our Service Department. Be sure to note this number on the outside of your shipping box. Returns without an RMA number will not be accepted for delivery.

NOTE:
Save the original shipping container and it's inside packing material should the monitor need to be returned for service.

Refer to the section *How To Contact Us*, found in the front of this manual, for important telephone numbers, fax numbers and email addresses.

3. SAFETY MEASURES AND WARNINGS

WARNING:

Do not use this instrument for any purpose other than specified in this manual. Doing so will invalidate the monitor's warranty.

Do not connect more than one (1) patient to the monitor.

Do not plug the monitor into an outlet controlled by a wall switch.

Before each use, verify that the alarm limits are appropriate for the patient being monitored.

The position of subject, physiological condition, and other factors affect the readings.

Blood pressure and pulse can fluctuate greatly between measurements; the monitor cannot alert the user to changes in vital signs occurring between measurement cycles.

Occasionally, electrical signals at the heart do not produce a peripheral pulse. If a patient's beat-to-beat pulse amplitude varies significantly (for example, pulsus alternans, atrial fibrillation, rapid-cycling artificial ventilator), blood pressure and pulse rate readings can be erratic and an alternate measuring method should be used for confirmation.

Where the integrity of the external protective conductor in the installation or its arrangement is in doubt, EQUIPMENT shall be operated from its INTERNAL ELECTRICAL POWER SOURCE.

Isolation of product from mains can only be achieved by removal of external power cord.

Do not, under any circumstances, perform any testing or maintenance on the monitor or power cord while the unit is being used to monitor a patient. Unplug the power cord before cleaning or servicing the monitor. The operator should not perform any servicing except as specifically stated in this manual.

Do not touch part of non-medical electrical equipment in the patient environment after removal of covers, connectors etc… without the use of a tool which operate at voltages not exceeding 25 VAC or 60 VDC and the patient at the same time.

Do not use a frayed or damaged power cord, or any accessory if you notice any sign of damage. Contact CAS Medical Systems for assistance.

The use of Accessory equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include:

- Use of the accessory in the Patient Environment.
- Evidence that the safety certification of the accessory has been performed in accordance with the appropriate IEC 60601-1 and/or IEC 60601-1-1 harmonized national standard.

Equipment not suitable for use in the presence of FLAMMABLE ANESTHETICS.

Equipment is not intended to be used in Oxygen Enriched Atmospheres.

WARNING:

Do not gas sterilize or autoclave the monitor.

Do not use the monitor in the presence of Magnetic Resonance Imaging (MRI) equipment.

Do not apply the blood pressure cuff on an extremity being used for an intravenous infusion.

Do not place liquids on top of the monitor. Do not immerse the monitor or power cord in water or any liquid. If unit is accidentally wetted it should be thoroughly dried. The rear cover can be removed by a qualified service technician to verify absence of water.

During use and testing, single-use disposable temperature probe covers will limit patient cross-contamination and ensure the safety of the patient, user and device. The use of any other probe covers or failure to use a probe cover may produce temperature errors and will invalidate the monitor's warranty.

A pulse oximeter should be considered an early warning device. As a trend toward patient deoxygenation is indicated, blood samples should be analyzed by a laboratory co-oximeter to completely understand the patient's condition.

Accurate oxygen saturation measurements cannot be obtained when the oximeter is not measuring the pulse properly. If the perfusion LED is erratic or the PULSE RATE display is erratic or inaccurate, first examine the patient for any sign of distress and only then re-examine sensor placement.

ACCURACY – If the accuracy of any measurement does not seem reasonable, first check the patient's vital signs by alternate means and then check the CASMED 740 Monitor for proper functioning.

CABLES – Route all cables away from patient's throat to avoid possible strangulation.

DEFIBRILLATION – Do not come in contact with patients during defibrillation. Serious injury or death could result.

DISPOSAL – Dispose of the packaging material, observing the applicable waste control regulations.

LEAKAGE CURRENT TEST – The interconnection of auxiliary equipment with this device may increase the total leakage current. When interfacing with other equipment, a test for leakage current must be performed by a qualified biomedical engineering personnel before using with patients. Serious injury or death could result if the leakage current exceeds applicable standards.

SITE REQUIREMENTS – For safety reasons, all connectors for patient cables and sensor leads are designed to prevent inadvertent disconnection, should someone pull on them. Do not route cables in a way that they may present a stumbling hazard. For devices installed above the patient, adequate precautions must be taken to prevent them from dropping on the patient.

CAUTION:

Before each use, make sure that the monitor default alarm settings are appropriate for the specific patient being monitored.

Pressing the front panel keyswitch with a sharp or pointed instrument may permanently damage the keyswitch. Press the keyswitch using only your finger.

Do not operate the monitor unless it has been properly calibrated. Inaccurate blood pressure readings may result. A calibration check is recommended once every year. A pneumatic check is recommended once every six (6) months.

As with any non-invasive oscillometric blood pressure monitor, the accuracy of the measurements obtained may be adversely affected by the presence of agents that alter the patient's cardiovascular system.

Do not alter the monitor's air hose. CAS Medical Systems cannot ensure proper monitor performance if the tubing is altered. Modification of the air hose will void the warranty. Avoid compression or restriction of pressure tubes.

A NIBP monitor does not operate effectively if a patient is having seizure activity, convulsions or tremors or is connected to a heart/lung machine.

In shock conditions, the low amplitude of the blood pressure waveform may make it difficult for the monitor to accurately determine the systolic and diastolic pressures.

When a patient is experiencing arrhythmias during a NIBP measurement, the accuracy of the pulse determination may be affected or the time needed to complete a measurement may be extended. The monitor will not make a determination beyond 120 seconds.

If the cuff is applied on a limb being used for oxygen saturation monitoring $\%SpO_2$ results will be altered during each blood pressure measurement due to the occlusion of blood flow.

Inspect the monitor, air hose and sensors for any damage prior to operation. If any damage is noted, the monitor should not be used until it has been serviced. The monitor should be repaired only by personnel authorized to do so by CAS Medical Systems, Inc.

Use only CAS Medical Systems approved accessories and sensors to preserve the integrity, accuracy and the electromagnetic compatibility of the monitor.

Consult a physician for interpretation of blood pressure measurements.

The oximeter is factory calibrated to determine the percentage of arterial oxygen saturation of functional hemoglobin.

Significant levels of dysfunctional hemoglobins such as carboxyhemoglobin or methemoglobin may affect the accuracy of the measurement.

Cardiogreen and other intravascular dyes, depending on the concentration, may affect the accuracy of the oximeter measurement.

CAUTION:

Some sensors may not be appropriate for a particular patient. If at least ten (10) seconds of one bar pulses cannot be observed for a given sensor, change sensor location or sensor type until this condition is achieved.

If the monitor fails to respond, do not use it until the situation has been corrected by qualified personnel.

Biting the probe tip while taking a temperature may result in damage to the probe.

ACCIDENTAL SPILLS – In the event that fluids are accidentally spilled on the monitor, take the monitor out of operation and inspect for damage.

BATTERY POWER – If the monitor will not be used or not connected to AC line power for a period over six (6) months, remove the battery.

ELECTRICAL SHOCK – To reduce the risk of electrical shock, do not remove the back cover. Refer all servicing to qualified personnel.

ELECTROMAGNETIC COMPATIBILITY (EMC) – The equipment needs special precautions regarding EMC. Be aware that strong electromagnetic fields may interfere with monitor operation. Interference prevents the clear reception of signals by the monitor. If the hospital is close to a strong transmitter such as TV, AM, or FM radio, police or fire stations, a HAM radio operator, an airport, or cellular phone, their signals could be picked up as signals by the monitor.

ELECTROSURGERY – Measurements may be affected in the presence of strong electromagnetic sources such as electro surgery equipment.

GROUNDING – Do not defeat the three-wire grounding feature of the power cord by means of adaptors, plug modifications, or other methods. Do not use extension cords of any type. Do not connect the monitor to an electrical outlet controlled by a wall switch or dimmer.

INTERFACING OTHER EQUIPMENT – Monitoring equipment must be interfaced with other types of medical equipment by qualified biomedical engineering personnel. Be certain to consult manufacturers' specifications to maintain safe operation.

STACKING – Where monitor is used adjacent to or stacked with other equipment, the monitor should be observed to verify normal operation in the configuration in which it will be used.

GENERAL NOTES:

There are no known risks with common disposal of equipment or accessories; however, the disposing of accessories should follow in accordance with local hospital policies. The user should ensure these policies do not conflict with any local, state or federal guidelines.

The monitor is suitable for use in the presence of electro surgery.

The monitor is suitable to be connected to public AC mains power.

The CASMED 740 Monitor is not “Category AP or APG Equipment”.

The CASMED 740 Monitor is for “Continuous Operation”.

The CASMED 740 Monitor applied parts are “Type BF Defibrillation Proof”.

The CASMED 740 Monitor provides “DRIP-PROOF” level of protection from ingress to moisture. Do not expose the CASMED 740 Monitor to extreme moisture levels such as direct exposure to rain. Exposure to extreme moisture levels may cause incorrect or inaccurate performance, or device failure during or after exposure.

AUTOMATIC SAFETY FEATURES

The monitor has been designed to promote patient safety. The maximum amount of time allowed to complete a blood pressure measurement is 120 seconds in adult mode and 90 seconds in neonate mode. If the measurement has not been completed within that time, the cuff is deflated automatically and a message is displayed indicating the problem.

To prevent exposure of the extremity to an inordinately high pressure, the cuff is deflated automatically when the pressure in the system is greater than 290 mmHg in the adult mode or 145 mmHg in the neonatal mode.

The cuffs used by the CASMED 740 Monitor are designed without transducers for patient safety. The transducers used for NIBP measurement are located inside the monitor on the NIBP board and are isolated from the patient.

In the event of a microprocessor failure, the cuff will be deflated automatically within ten (10) seconds.

All equipment parts are protected against the effects of the discharge of a defibrillator. No separate actions are required when using this equipment with a defibrillator.

Should the AC or DC power be interrupted coming into the monitor, the monitor automatically runs off battery power. An indication of this would be a change in color of the Battery Power Visual Indicator LED from Green to either Orange or Red.

Whenever the power is disconnected from the monitor and the monitor is not allowed to shut down in an orderly fashion, the monitor, when re-powered alerts the user.

CAUTION:
Regardless of these safety features, always be sure to check that there are no signs of prolonged impairment of circulation and that the monitor is functioning properly.

4. DECLARATION OF CONFORMITY

Manufacturers Declaration of Conformity
Electronic Emissions and Immunity

The Model 740 Monitor is intended for use in the electromagnetic environment specified below. The customer or the user of the Model 740 Monitor should assure it is used in such an environment.		
Emissions Test	**Compliance**	**Electromagnetic Environment**
RF emissions – CISPR 11	Group 1	The Model 740 Monitor uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions – CISPR 11	Class B	The Model 740 Monitor is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class B	
Voltage fluctuations / flicker emissions	Complies	

Immunity Test	**IEC 60601 Test Level**	**Compliance Level**	**Electromagnetic Environment Guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	+/- 6 kV contact +/- 8 kV air	+/- 6 kV contact +/- 8 kV air	Floors should be wood concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	+/- 2 kV for power supply lines +/- 1 kV for input/output lines	+/- 2 kV for power supply lines +/- 1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	+/- 1 kV differential mode +/- 2 kV common mode	+/- 1 kV differential mode +/- 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage Dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T (>95% dip in U_T) for 0.5 cycle. 40% U_T (60% dip in U_T) for 5 cycles. 70% U_T (30% dip in U_T) for 25 cycles. < 5% U_T (> 95% dip in U_T) for 5 seconds.	< 5% U_T (>95% dip in U_T) for 0.5 cycle. 40% U_T (60% dip in U_T) for 5 cycles. 70% U_T (30% dip in U_T) for 25 cycles. < 5% U_T (> 95% dip in U_T) for 5 seconds.	Mains power quality should be that of a typical commercial or hospital environment. If user of the Model 740 Monitor requires continued operation during power mains interruptions, it is recommended that the Model 740 Monitor be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the A.C. mains voltage prior to application of the test level.			

Guidance and Manufacturer's Declaration – Electromagnetic Immunity

The Model 740 Monitor is intended for use in the electromagnetic environment specified below. The customer or the user of the Model 740 Monitor should insure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the Model 740 Monitor, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance:**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	$d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	$d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz Where *P* is the maximum output power rating of the transmitter in watts according to the transmitter manufacturer and *d* is the recommended separation distance in meters. Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey [a], should be less than the compliance level in each frequency range. [b] Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is effected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular / cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Model 740 Monitor is used exceeds the applicable RF compliance level above, the Model 740 Monitor should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Model 740 Monitor.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and the Model 740 Monitor

The Model 740 Monitor is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Model 740 Monitor can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Model 740 Monitor as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (Watts)	Separation distance according to frequency of transmitter (Meters)		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters operating at a maximum output power not listed above, the recommended separation distance *d* in meters can be estimated using the equation applicable to the frequency of the transmitter, where *P* is the maximum output power rating of the transmitter in watts according to the transmitter manufacturer.
NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

5. SYMBOLS

The following is a summary of all symbols used on the monitor and accessories. Symbols may occur on the product or on its packaging.

Units may display the following symbols:

Alternating Current

CAUTION: Before using, read instructions included.

The CE Mark and Notified Body Registration Number signify the device has met all essential requirements of European Medical Device Directive 93/42/EEC.

This symbol appears here instead of on the unit.
The first two digits of the unit's serial number indicate the year of manufacture in the 21st century.

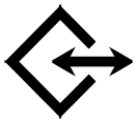
Indicates this monitor is subject to the Waste Electrical and Electronic Equipment Directive in the European Union.

Medical Electrical Equipment Classification
Class II equipment (if applicable)

The CASMED 740 Monitor is normally a Class I device.

The CASMED 740 Monitor becomes a Class II device when it is mounted and connected to a DC power source (740M).

SYMBOLS **(CONT.)**

IPX1	Protection against ingress of water.
	Symbol used on the rear panel of the CASMED 740M, to indicate the polarity of the DC power input.
	Direct Current
	Indicates protection against the effects of the discharge of a cardiac defibrillator. Patient connections are Type BF and protected against defibrillation.
	Equipotentiality Ground Post
MAXNIBP®	NIBP Hose and Cuff Connector
SpO_2	Pulse Oximeter Probe Connector
	Two way Communication Port RS232 and Nurse Call Interface Connector
	Temperature Probe Connector

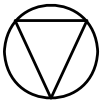
SYMBOLS (CONT.)

These symbols appear on the front panel in place of text.

ON/STANDBY – Turns “ON” the Monitor’s display.
NOTE: Monitors shipped earlier displayed the symbol .

SILENCE/RESET

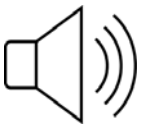
START/STAT



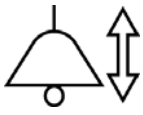
STOP

CYCLE TIME

HISTORY



VOLUME



ALARM LIMITS

SYMBOLS (CONT.)

ARROW UP

ARROW DOWN

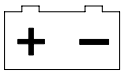
Bar graph display of SpO_2 signal strength.

♥ BPM Pulse Rate Display

ADULT A lighted LED used to indicate NIBP operating in Adult Mode.

NEO A lighted LED used to indicate NIBP operating in Neonatal Mode.

TEMP A lighted LED used to indicate the Temperature Option is installed.

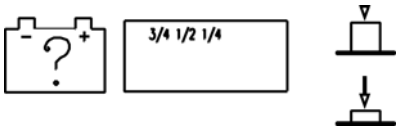


A tri-colored LED used to indicate the status of the monitors power source.

SYMBOLS (CONT.)

These symbols appear on the battery pack in place of text.

Recycling suggested (see General Notes).



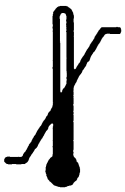
Located on the Smart Pack batteries, if available, a set of four (4) LEDs used to indicate the approximate amount of charge remaining in the battery pack.

These symbols appear on the packaging in place of text.

Lot Number

Symbol used to indicate where Relative Humidity information concerning storage and transport can be located.

Single Patient Use. Do Not Reuse.



Symbol used to indicate the minimum and maximum storage and transport Temperatures.

Use By date (yyyy-mm)

SYMBOLS (CONT.)

This symbol appears on the printer in place of text.

WARNING: Before removing, read instructions located in User's Manual.

6. MONITOR CONTROLS

FRONT PANEL

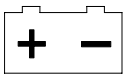
Front Panel Keyswitch panel with English text

Front Panel Keyswitch panel, Symbols only

Figure 2: **Front Panel Views**

DIGITAL DISPLAY AND INDICATORS

SYSTOLIC mmHg	Red colored LEDs indicate the Systolic pressure measurement in mmHg.
DIASTOLIC mmHg	Red colored LEDs indicate the Diastolic pressure measurement in mmHg.
MAP mmHg	Red colored LEDs indicate the Mean Arterial Pressure in mmHg (if enabled).
TEMP	A Yellow LED indicator with Red colored LEDs indicates temperature value (if installed).
% SpO_2	Green colored LEDs indicates the %SpO_2 value (if installed).
♥ **BPM**	Red colored LEDs indicate the Pulse Rate in BPM (beats per minute).
	Green colored LEDs provide a visual indication of the SpO_2 signal strength in a bar graph form (if installed).
ADULT	A yellow LED indicator used to inform the user that the NIBP is operating in the Adult Mode.
NEO	A yellow LED indicator used to inform the user that the NIBP is operating in the Neonatal Mode.
TEMP	A yellow LED indicator used to inform the user that the Temperature Option is installed.
Ready	Message Window area used to display various messages that aid the user in monitor operation.



A tri-colored visual indicator used to display the status of the power source and battery condition.

The status of the LED is:

- GREEN = Monitor is connected to a main power source
- ORANGE = In Use on Battery
- RED = Battery Low or Dead Battery

A Yellow LED visual indicator used along with the SILENCE/RESET pushbutton to display the status of the Audio Alarm Silence feature.

The status of the LED is:

- “ON” continuously = 2 Minute Audio Silence
- Flash one second “ON”/one second “OFF” = Permanent Audio Alarm Silence

FRONT PANEL CONTROLS

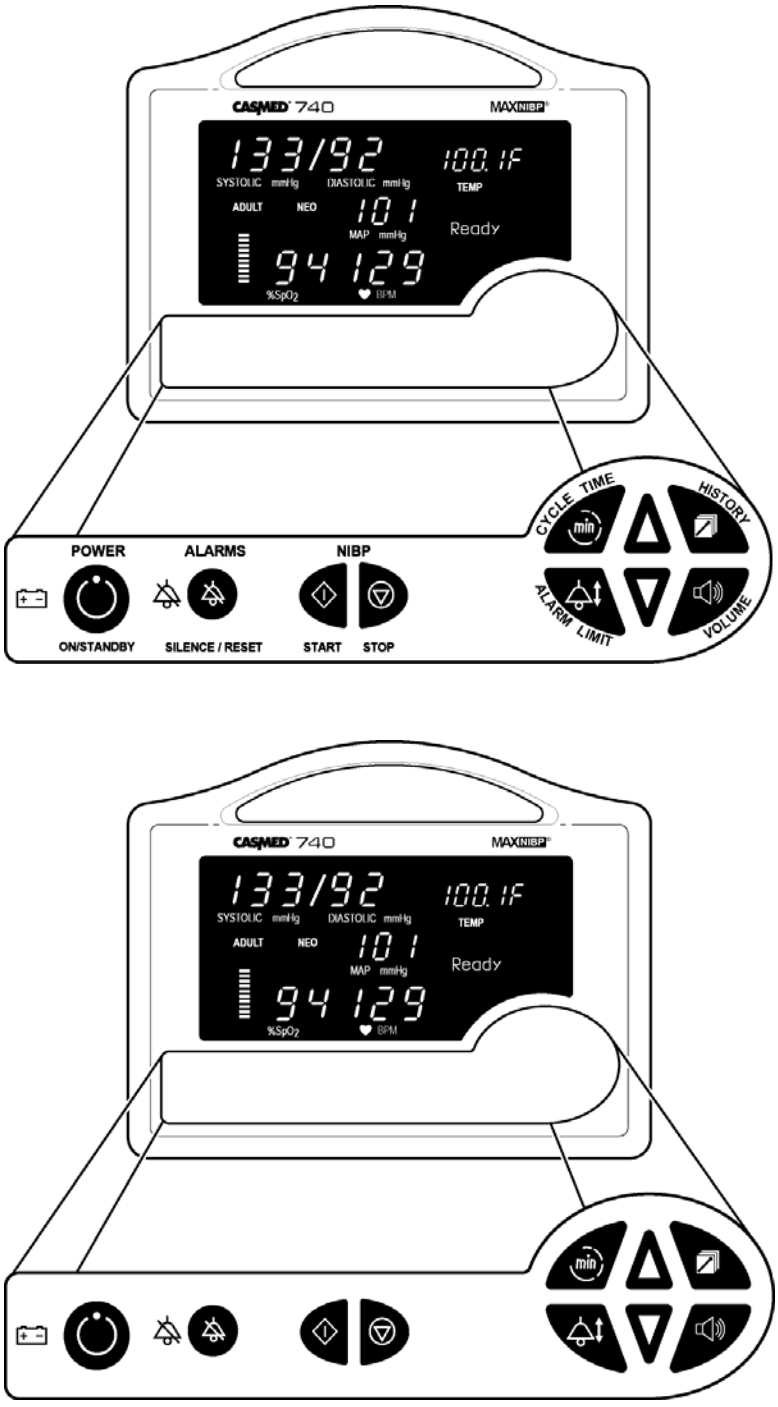


Figure 3: **Front Controls**

ON/STANDBY:

Press once, turns “ON” the CASMED 740 Monitor’s display (if it was OFF).

To turn the monitor’s display “OFF”, either press once or press and hold for two (2) seconds. Based on the selection for Power-Off Delay Time in the Configuration menu. Refer to Page 47 for more information.

NOTE: Monitors shipped earlier displayed the symbol .

SILENCE/RESET:

When pressed during an active patient alarm, silences the audio portion of that alarm for fifteen (15) seconds.

When pressed during an active equipment alarm, the alarm condition shall be acknowledged along with the audio and visual shall be removed.

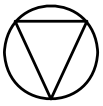
Used to enable and disable the two (2) Minute Audio Off or Permanent Audio Off feature.

Allows the user to clear NIBP, SpO_2 and Temperature messages from the front panel display.

START/STAT:

START:
Initiates a blood pressure measurement in the Manual Mode or begins the selected Automatic Cycle.

STAT:
Starts a series of NIBP measurements (press and hold for two (2) seconds). Continues for five minutes.



STOP:

Cancels any active blood pressure function and immediately deflates the cuff.

Also used to cancel out of a menu and return to “Ready”.

CYCLE TIME:

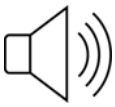
Allows the user to select a time interval for Automatic blood pressure measurement.

Automatic measurement cycles of 1, 2, 3, 4, 5, 10, 15, 30, 60, or 90 minutes may be chosen.

Also used to read the monitor's current time (press and hold for two (2) seconds).

HISTORY:

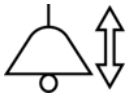
Allows the user to review stored patient readings.



VOLUME:

Used to set the volume level of the Alarms and the SpO_2 Beep (if SpO_2 installed). Use the Up and Down Arrows to change.

Also used to adjust the brightness of the front panel displays (press and hold for two (2) seconds).



ALARM LIMITS:

Allows the user to enter and set the monitor's Alarm Limits.

ARROW UP:

Allows forward Adjustment (Auto Cycle, History, Inflation Pressure, Limits and Monitor Configuration).

Press to cycle through menu selections or press and hold for quicker advance.

Sets the patient mode to Adult when pressed and hold while the monitor is being turned on.

ARROW DOWN: Allows backwards Adjustment (Auto Cycle, History, Inflation Pressure, Limits and Monitor Configuration).

Press to cycle through menu selections or press and hold for quicker advance.

Sets the patient mode to Neonate when pressed and hold while the monitor is being turned on.

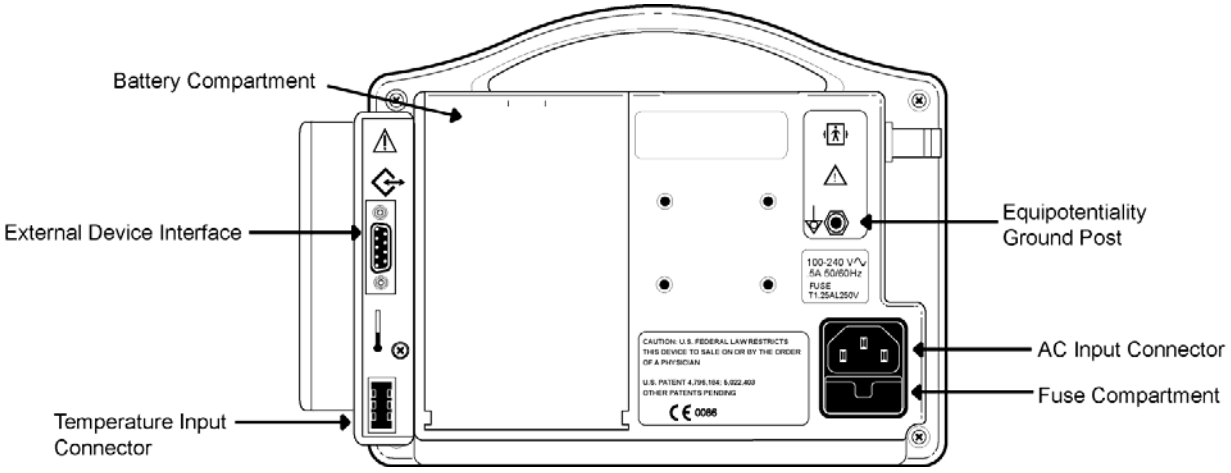
NEXT The HISTORY and VOLUME pushbutton keys have been programmed to allow the user to advance forward to the ***next*** selection in the Monitor Configuration menu.

PREVIOUS The CYCLE TIME and ALARM LIMITS pushbutton keys have been programmed to allow the user to advance backwards to the ***previous*** selection in the Monitor Configuration menu.

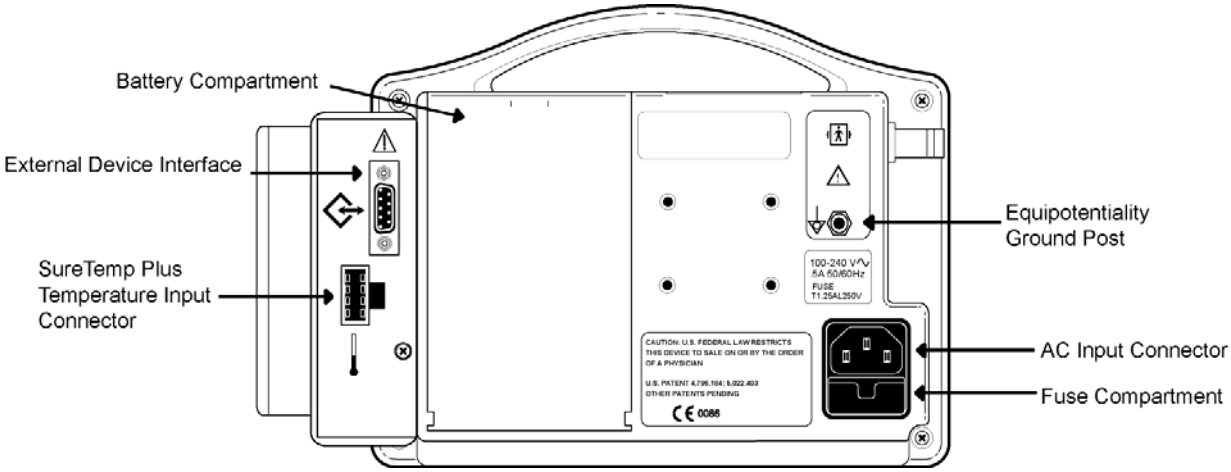
INFRARED (IR) DATA PORT

An Infrared (IR) output port, located on the bottom panel of the monitor's front cover, is available to print the NIBP, %SpO_2 and Temperature History data to the optional external printer or other data collection device(s).

REAR PANEL

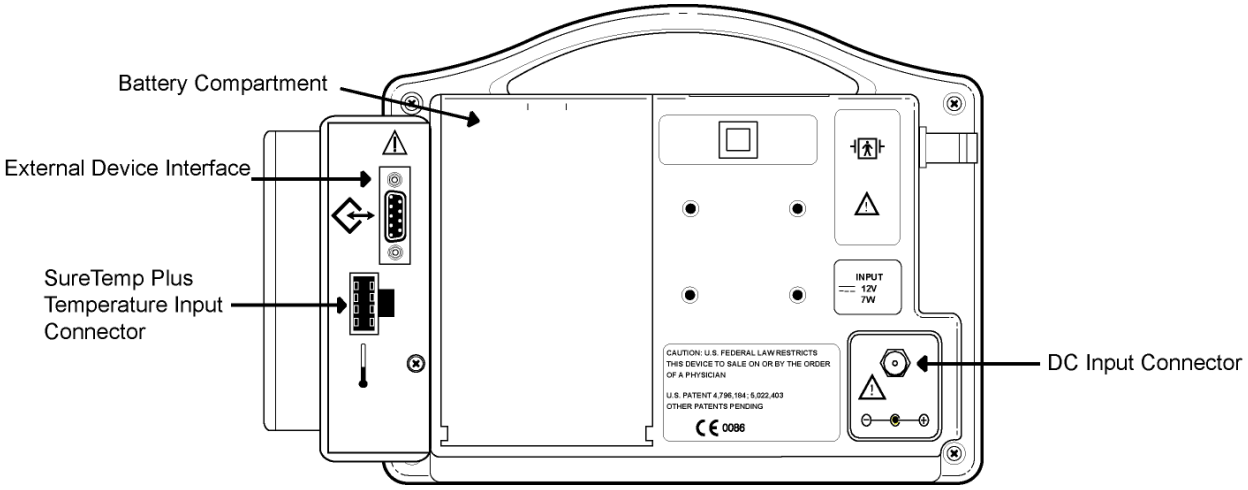


SureTemp®



SureTemp® Plus

Figure 4: **740 Rear Panel View**



740M

Figure 5: **740M Rear Panel View**

AC / DC CONNECTION

Receptacle for the AC power cord when the CASMED 740 Monitor is purchased with an AC Line Power option and built–in battery.

When the CASMED 740 Monitor is purchased as an EMS monitor equipped with a Swivel Mount (740M), the ambulance DC power cord is attached here.

FUSE COMPARTMENT

When the CASMED 740 Monitor is purchased for AC Line power, the power input receptacle incorporates dual fuses located in the hot and neutral lines.

BATTERY COMPARTMENT

The CASMED 740 Monitor is equipped with a 7.2 Volt, 3700 mAhr battery pack that, when fully charged, is capable of taking 100 NIBP readings when the monitor is set in the 5-minute Automatic Mode.

NOTE:
The serial number label is located on the bottom of the monitor.

TEMPERATURE PROBE ELECTRICAL CONNECTION
(if equipped)

Connect the Temperature cable in this receptacle for Temperature monitoring. Leave the probe connection in place. The Temperature function is OFF until the probe is removed from the holder.

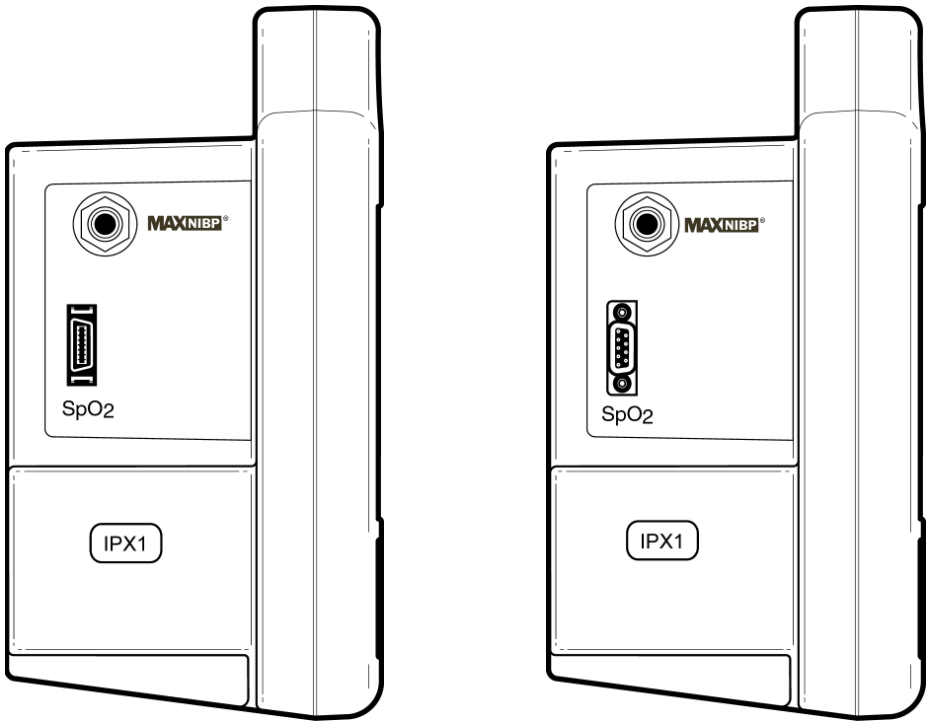
EQUIPOTENTIALITY GROUND POST

This terminal can be used to provide an auxiliary ground for the monitor.

EXTERNAL DEVICE INTERFACING

The CASMED 740 Monitor is available with a combined optional DB9 RS232 output and Nurse Call interface. The RS232 output maybe used to interface to the Citizen CMP-10 Mobile Printer or another serial printing device.

LEFT SIDE VIEW



Masimo and Nellcor Nonin

Figure 6: **Left Side Panel Views**

MAXNIBP®

CUFF HOSE CONNECTION

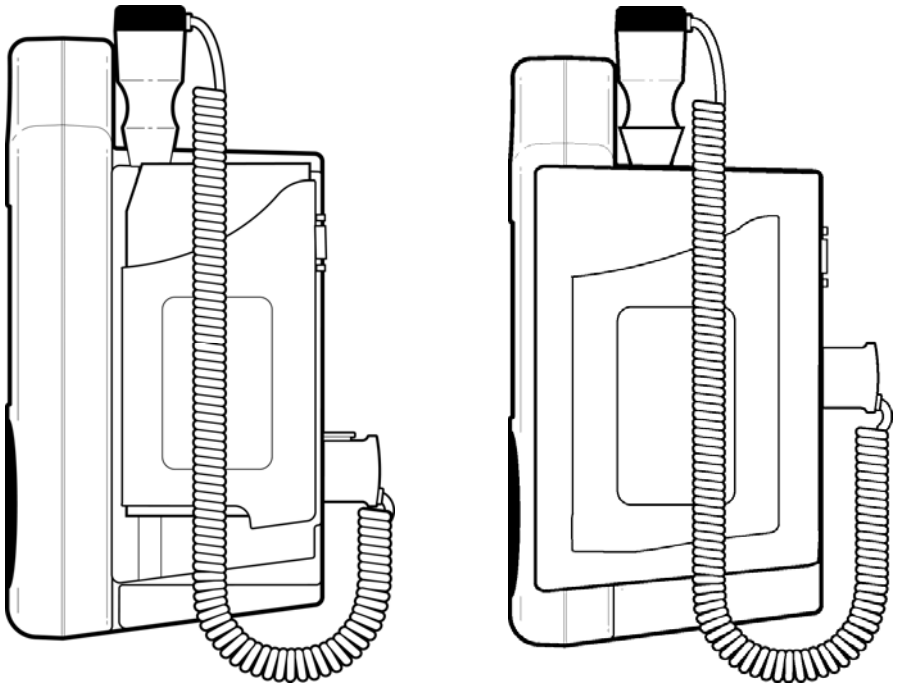
The inflation hose is connected to the monitor where the MAXNIBP logo is located as shown in Figure 6. The hose must be connected to the cuff prior to use.

NOTE:
An optional six (6) foot inflation hose is available when monitoring in the NEO mode. Refer to the Accessories section in the User's Manual for part number information.

SpO_2 SENSOR CONNECTION
(if equipped)

Connect the sensor cable in this receptacle for SpO_2 monitoring.

RIGHT SIDE VIEW



SureTemp SureTemp Plus

Figure 7: **Right Side Panel View**

TEMPERATURE HOLDER
(if equipped)

Store the Temperature Probe and Temperature Probe Covers in their holder locations when it is not in use.

NOTE:
Insure that the Temperature probe is secured in its holder. An audible “click” should be heard when the SureTemp probe is completely placed into its holder. The SureTemp Plus probes will slide in and out of the Probe Well without any restrictions.

7. MONITOR CONFIGURATION

The Monitor Configuration section allows the user to configure the CASMED 740 Monitor. Once entered, the user can:

- Review the monitor's internal Software Revisions
- Set the Operating Language
- Select the Patient Mode
- Select the Power-Off Delay Time
- Select the Temperature Scale
- Make selections for Audio Alarms
- Choose to display the MAP value
- Set the SpO_2 Alarm Delay
- Set the Date
- Set the Time
- Set Daylight Saving Time Option
- Perform System Checks (Refer to CONFIGURATION MODE TESTS)
  - All LEDs "ON" Check
  - +12 Volt Power Supply Check
  - Manometer Mode
  - Pneumatic Pressure Check
  - Temperature Calibration Check

ENTERING THE MONITOR CONFIGURATION MENU

To enter the monitor's Configuration Menu, press and hold the ALARM LIMITS and VOLUME pushbutton keys while the monitor is being turned "ON" .

Once in the menu, use one of the *NEXT* (HISTORY / VOLUME) or *PREVIOUS* (CYCLE TIME / ALARM LIMITS) programmed pushbutton keys to advance onto the next or go back to the previous parameter in the Configuration Menu.

NOTE:
While in the Configuration Menu, if no pushbutton is pressed within 60 seconds, the monitor will automatically save all changes made and exit the Monitor Configuration menu. The Message Window will briefly display "Saving" and return to the "Ready" mode.

SAVING YOUR CHANGES

When you have completed configuring the monitor, press the STOP pushbutton to exit and lock in your selection(s). The Message Window will briefly display "Saving" and return to the "Ready" mode.

SOFTWARE REVISIONS

The CASMED 740 Monitor displays the current software revision of its operating system and that of the internal modules being used inside. The software versions are displayed in the following order:

Software Module	Message Window
CASMED 740 Control Board	VER X.X
Boot Loader	BootX.XX
Power Supply PIC Processor	PIC X.X
CAS NIBP Module	ND X.X
Nellcor SpO_2 Module (1) Masimo SpO_2 Module (1) Nonin SpO_2 Module (1)	NEL X.X MAS X.X NON XX
Welch Allyn Temperature Module (2)	WA X.X

Table 3: **Software Revisions**

Use the ARROW UP or ARROW DOWN pushbuttons to view the messages.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the “Ready” mode.

SETTING THE LANGUAGE

The CASMED 740 Monitor can operate in one (1) of nine (9) languages: English, German, French, Italian, Spanish, Dutch, Swedish, Portuguese or Norwegian.

To configure the monitor’s operating language, first enter the monitor’s Configuration menu. Refer to Page 45, ENTERING THE MONITOR CONFIGURATION MENU.

Once in the menu, use one of the *NEXT* programmed pushbutton keys until the Message Window displays the current language being used.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the “Ready” mode.

(1) The SpO_2 module is optional, in the case when it is not installed the Version text advances to the next Module.

(2) The Temperature module is optional, in the case when it is not installed the Version text advances to the next Module.

SELECTING THE PATIENT MODE

The CASMED 740 Monitor can be used on patients from Neonates to Adults.

To configure the monitor's operating mode, first enter the monitor's Configuration Menu. Refer to Page 45, ENTERING THE MONITOR CONFIGURATION MENU.

Once in the menu, use one of the *NEXT* programmed pushbutton keys until the Message Window displays "PATIENT".

Use the ARROW UP or ARROW DOWN pushbuttons to select the patient mode. The front panel display will illuminate with the patient mode selected (ADULT = Adult / Pediatric; NEO = Neonate).

NOTE:
Altering the patient mode automatically sets the parameter High and Low Limits to the appropriate patient default limits and affects the NIBP mode. Refer to the CASMED 740 Monitor User's Manual for more information.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the "Ready" mode.

SELECTING THE POWER-OFF DELAY TIME

The CASMED 740 Monitor incorporates a user selectable Power-Off Delay time feature. The amount of time the ON/STANDBY pushbutton is pressed to turn the display "OFF" can be configured to be either "Off 0S" (no delay) or "Off 2S" (press and hold for 2 seconds). The default setting used by the monitor is "Off 0S".

To configure the Power-Off Delay Time, first enter the monitor's Configuration menu. Refer to Page 45, ENTERING THE MONITOR CONFIGURATION MENU.

Once in the menu, use one of the NEXT programmed pushbutton keys until the Message Window displays the monitor's current setting for the Power-Off Delay Time.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection.

Press one of the NEXT programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the "Ready" mode.

SELECTING THE TEMPERATURE SCALE
(available if Temperature is installed)

The CASMED 740 Monitor can display Temperature readings in either the Celsius or Fahrenheit scales.

To select the operating Temperature Scale, first enter the monitor's Configuration menu. Refer to Page 45, ENTERING THE MONITOR CONFIGURATION MENU.

Once in the menu, use one of the *NEXT* programmed pushbutton keys until the Message Window displays the Temperature setup menu "°F" or "°C".

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the "Ready" mode.

AUDIO ALARM SILENCE (SILENCE/RESET Pushbutton)

The CASMED 740 Monitor's SILENCE/RESET pushbutton can be configured to have the audio associated with patient alarms set to one of three selections. The selections are:

- 2-Minute Audio Alarm Silence (Default)
- Permanent Audio Alarm Silence
- Alarm Limits Off

To configure the Alarm Silence setting, first enter the monitor's Configuration menu. Refer to Page 45, ENTERING THE MONITOR CONFIGURATION MENU.

Once in the menu, use one of the *NEXT* programmed pushbutton keys until the Message Window displays the current value of the Audio Alarms menus.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the "Ready" mode.

2-MINUTE AUDIO ALARM SILENCE

When the monitor is configured for the 2-Minute Audio Alarm Silence setting, use the SILENCE/RESET pushbutton to "enable or disable" audio alarms for a two (2) minute period. The SILENCE visual indicator, located on the front panel of the monitor will be illuminated constantly and the message "2Min Aud" will be displayed on the Message Window as a reminder when enabled. At the end of two (2) minutes, the monitor will automatically exit the 2-Minute Audio Alarm Silence setting and return to normal operation.

During a two-minute silence period, if an alarm (patient or equipment) occurs, except for Low Battery and Dead Battery, the audio alarm remains silenced for the remainder of the two-minutes and only a visual indicator is provided.

PERMANENT AUDIO ALARM SILENCE

When the monitor is configured to the Permanent Audio Alarm Silence setting, use the SILENCE/RESET pushbutton to “enable or disable” audio alarms. The SILENCE visual indicator, located on the front panel of the monitor will flash at a rate of one (1) second “ON” and one (1) second “OFF” and the message “Perm Aud” is displayed on the Message Window as a reminder when enabled.

During a permanent audio alarm off period, if an alarm (patient or equipment) occurs, except for Low Battery and Dead Battery, the audio alarm remains silenced and only a visual indicator is provided.

ALARM LIMITS OFF

When the monitor is configured to the Alarm Limit Off setting, all alarms associated with patient alarms are “OFF”. This mode is useful for spot check applications or if the monitor is being moved from patient to patient and the user may not want to be disturbed by any audible alarms.

The SILENCE visual indicator, located on the front panel of the monitor will flash at a rate of two (2) seconds “ON” and two (2) seconds “OFF” and the message “Alrm Off” will be displayed on the Message Window as a reminder when enabled.

During an alarm limit off period, if an equipment alarm occurs, except for Low Battery and Dead Battery, the audio alarm remains silenced and only a visual indicator is provided.

MAP VALUE ENABLE / DISABLE

During a blood pressure reading, the user can elect to display or not to display the MAP value.

To configure the MAP value, first enter the monitor’s Configuration menu. Refer to Page 45, ENTERING THE MONITOR CONFIGURATION MENU.

Once in the menu, use one of the NEXT programmed pushbutton keys until the Message Window displays the monitor’s current setting for the MAP value “MAP On” or “MAP Off”.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection.

NOTE:
When “MAP Off” is selected, MAP values are omitted from History Display and Printing as well. All alarms associated with MAP values are also disabled.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the “Ready” mode.

SET THE SpO_2 ALARM DELAY

The delay time until an alarm is generated for $\%SpO_2$ and Pulse Rate can be configured to be either zero (0) seconds “Delay 0S” or ten (10) seconds “Delay10S”. The default value used by the Model 740 Monitor is ten (10) seconds.

To configure the SpO_2 Alarm Delay, first enter the monitor’s Configuration menu. Refer to Page 45, ENTERING THE MONITOR CONFIGURATION MENU.

Once in the menu, use one of the NEXT programmed pushbutton keys until the Message Window displays the monitor’s current setting for the SpO_2 Alarm Delay.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection.

Press one of the NEXT programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the “Ready” mode.

SETTING THE DATE

The CASMED 740 Monitor’s Date value is set at the factory.

To set the Date, first enter the monitor’s Configuration menu. Refer to Page 45, ENTERING THE MONITOR CONFIGURATION MENU.

Once in the menu, use one of the *NEXT* programmed pushbutton keys until the Message Window displays the monitor’s date using the following format: “DDMMMYY”. Where DD = Day of the Month, MMM = Month of the Year (Jan, Feb, etc.) and YY = Last 2 digits of the year (2002 is displayed as 02). The flashing parameter indicates the parameter that can be changed.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection. Press one of the *NEXT* programmed pushbutton keys to advance to the next parameter to set within the Date menu.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the “Ready” mode.

SETTING THE TIME

The CASMED 740 Monitor’s Time value is set for Eastern Time and is set at the factory.

To set the Time, first enter the monitor’s Configuration menu. Refer to Page 45, ENTERING THE MONITOR CONFIGURATION MENU.

Once in the menu, use one of the *NEXT* programmed pushbutton keys until the Message Window displays the monitor’s time using the following format: “HH:MM”. Where HH = Hour of the Day (0 – 23) and MM = Minute of the Hour (0 – 59). The flashing parameter indicated the parameter that can be changed.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection. Press one of the *NEXT* programmed pushbutton keys to advance to the next parameter to set within the Time menu.

NOTE:
Altering the Date and Time will affect the History readings, but not erase them.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the "Ready" mode.

DAYLIGHT SAVING TIME OPTION

The CASMED 740 Monitor can be configured to automatically respond to time changes associated with Daylight Saving Time. The monitor can be configured to one of five Daylight Saving Time Option settings. They are:

- DST OFF — Daylight Saving Time is "OFF". The user is responsible for changing the time if needed. This is the default setting for the CASMED 740 Monitor.
- DST N AM — Daylight Saving Time "North America". Use this setting and the monitor will automatically change time accordingly to the Daylight Saving Time for countries in North America.
- EU 1 — Daylight Saving Time for all European countries using Greenwich Mean Time.
- EU 2 — Daylight Saving Time for all European countries 1 hour ahead of Greenwich Mean Time.
- EU 3 — Daylight Saving Time for all European countries 2 hours ahead of Greenwich Mean Time.

NOTE:
Enabling Daylight Saving Time will affect the History readings, but not erase them.

To configure the Daylight Saving Time option, first enter the monitor's Configuration menu. Refer to Page 45, ENTERING THE MONITOR CONFIGURATION MENU.

Once in the menu, use one of the NEXT programmed pushbutton keys until the Message Window displays the monitor's current setting for Daylight Saving Time.

Press one of the NEXT programmed pushbutton keys to advance onto the next menu or use the STOP pushbutton to exit to the "Ready" mode.

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8. EXTERNAL DEVICE INTERFACING

OVERVIEW

The CASMED 740 Monitor is capable of interfacing to an external Serial printer or have the ability to interface to a Nurse Call System if the DB9 RS232 option is available. Both connections are made through the DB9 connector located on the rear panel of the monitor.

WARNING:
The CASMED 740 Monitor has been tested with the Citizen CMP-10 Mobile printer to comply with IEC 60601-1-1 and is the only printer that is recommended to be used with the monitor. If another printer is to be used, the user must read the Warning on Page 20 under LEAKAGE CURRENT TEST and follow the guidance given.

RS232

The CASMED 740 monitor uses the DB9 connector to interface to the Citizen CMP-10 Mobile printer using the cable supplied with the printer. The connector information provided in this section is made available to allow the user the ability to print the monitor's History data to an external serial printer. Refer to Figure 8 and Table 4 for connection information.

Refer to Section15, SPECIFICATIONS for Serial Interface information.

NURSE CALL INTERFACE

The CASMED 740 Monitor provides an isolated relay switch closure output connection between two (2) of the pins on the DB9 RS232 output connector. The output is compatible with most Nurse Call Systems in that there is no polarity to the connection.

When properly connected, the Nurse Call Interface activates the Nurse Call System each time an alarm is activated on the monitor. The delay time for the Nurse Call Interface to activate is less than 0.5 seconds.

The Nurse Call System's relay contacts are rated at 120 VAC at 0.3A; or 30 VDC at 1.0 A.

The Nurse Call Option is available as a normally open (closed on alarm) or normally closed (open on alarm) depending upon how it is wired.

For normally open (N.O.) applications, the Nurse Call system needs to be connected to pins 1 and 9 of the RS232 connector. For normally closed (N.C.) applications, the Nurse Call system needs to be connected to pins 6 and 9. Refer to Figure 8 and Table 4 for connection information.

WARNING:
The connection to the Nurse Call Interface should only be installed by a qualified service personnel.

WARNING:
The interconnection of auxiliary equipment to the Nurse Call Interface may increase the total leakage current. The user must read the Warning on Page 20 under LEAKAGE CURRENT TEST and follow the guidance given.

NOTE:
Even though the Nurse Call Interface allows remote alarm indication, it does not replace appropriate bedside surveillance by trained clinicians.

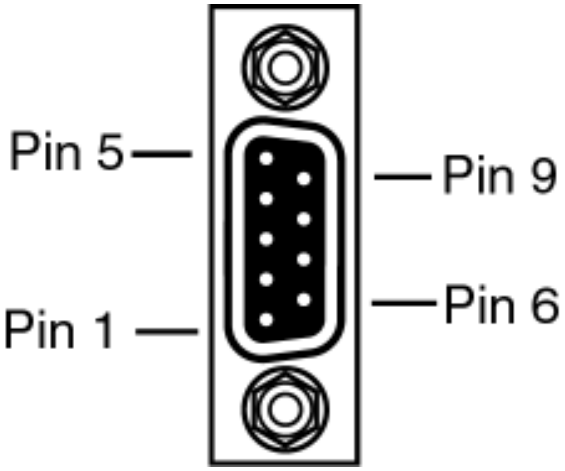

Figure 8: **DB9 Male Connector Pin Layout**

Pin Number	Signal Description
1	Nurse Call (N.O.)
2	Serial Receive In
3	Serial Transmit Out
4	No Connection
5	Isolated Ground
6	Nurse Call (N.C.)
7	No Connection
8	No Connection
9	Nurse Call (common)

Table 4: **DB9 Pin Out**

9. ROUTINE MAINTENANCE

CLEANING

CLEANING OVERVIEW

WARNING:
Do not, under any circumstances, perform any testing or maintenance on the monitor while the monitor is being used to monitor a patient.

CAUTION:
Do not open the monitor to clean or repair it. Contact CAS Medical System for service needs.

CAUTION:
Unplug the monitor from the AC power source and remove all the accessories from the monitor before cleaning. The monitor must be turned off and not running on the internal battery. Never clean the monitor when it is being operated.

THE MONITOR

On a daily basis, examine the monitor's case for any damages and check the AC power cord for bent or broken prongs, cracks or fraying. Neither the monitor nor the power cord should be used if damaged. If any damage is noted, contact the appropriate service personnel.

CAUTION:
Do not spray any water or cleaning solution directly onto the monitor.

As needed, clean the monitor using a soft cloth dampened with a mild dishwashing detergent solution and gently rub the soiled area until clean. Use a clean soft cloth to dry the monitor. Do not use abrasive cleaners on the monitor. Do not use either isopropyl alcohol or solvent to clean the monitor. Use of these cleaners can cause damage to the monitors' surface. Do not immerse the monitor or power cord in the cleaning solution.

When necessary, the monitor surfaces may be disinfected using a soft cloth saturated with a 10% (1:10) solution of chlorine bleach in tap water. When all of the surfaces have been disinfected, wipe the entire surface of the monitor using a soft cloth dampened with fresh water to remove any trace amounts of residue and/or fumes.

NOTE:
Thoroughly wipe off any excess cleaning solutions. Care should be taken to prevent water or cleaning solution to run into connector openings or crevices.

THE DISPLAY

CAUTION:
Use care when cleaning the display. Scratches may occur.

Occasionally, as needed, clean the display window using a soft, lint-free cloth sprayed with an alcohol free glass cleaner. Do not use either isopropyl alcohol or solvent to clean the display. Use of these cleaners can cause damage to the display. The use of paper towels is not recommended as it may scratch the surface.

CUFFS

Prior to each patient use, inspect the blood pressure cuff for damage.

CAUTION:
If the cuff should become grossly contaminated with blood or other bodily fluids, it should be discarded.

NOTE:
CAS does not recommend submersion of the cuff. Liquid should not be permitted to enter the cuff bladder because instrument damage may occur. The cuff should be allowed to thoroughly dry before use.

TUFF-CUFF

As necessary, clean the cuff using a soft cloth dampened with a 70% Isopropyl Alcohol solution.

SAFE-CUFF

As necessary, clean the cuff using a soft cloth dampened with a soap, water-based detergent or chlorinated disinfectant solution. Do not use alcohol.

SOFTCHECK

These cuffs are designed for single patient use, and are not to be reprocessed.

ULTRACHECK

As necessary, for normal cleaning with mild detergents / dilute bleach solution (1-2%), wipe the cuff with the cleaning solution, rinse with water and dry.

PNEUMATIC TUBING

CAUTION:
If the hose should become grossly contaminated with blood or other bodily fluids, it should be discarded.

NOTE:
CAS does not recommend submersion of the hose. Liquid should not be permitted to enter the hose because instrument damage may occur. The hose should be allowed to thoroughly dry before use.

Prior to each patient use, inspect the NIBP Inflation Hose for proper connection, cracks and kinks. As necessary, clean the pneumatic tubing using a soft cloth dampened with a germicidal solution.

PRINTER

When the printer becomes dirty, wipe with a soft dry cloth. For extreme dirt buildup, soak a cloth with mild detergent, wring well and wipe. Dry by wiping with a soft dry cloth.

CAUTION:
Before cleaning the printer, disconnect the AC adapter from the printer.
Do not use volatile chemicals such as thinner, benzine, etc.
Never wet the inside of the printer mechanism.

Refer to the printer User's Manual for more information.

SpO_2 INTERCONNECT CABLE

Prior to each patient use, inspect the SpO_2 Interconnect cable for damage. As necessary clean the cable using a soft cloth dampened with a germicidal solution.

SpO_2 SENSORS
(Reusable)

As necessary, the sensor may be surface cleaned by wiping it with a 70% isopropyl alcohol pad. Allow the sensor to dry prior to placement on a patient.

CAUTION:
Do not soak or immerse the sensor or its cable in any liquid solution. Do not attempt to sterilize.

Refer to the Directions For Use pamphlet enclosed with each sensor for more information.

TEMPERATURE PROBES

CAUTION:
Do not soak or immerse the probe or its cable in any liquid solution. Do not attempt to sterilize.

The temperature probe should periodically be cleaned by wiping with an alcohol dampened cloth or wipe, warm water, or properly diluted non-staining disinfectant.

PROBE WELL (SureTemp® Plus)

CAUTION:
Do not use hard or sharp objects to clean the probe well. This could damage the probe well and cause the unit to not function properly.
Do not use steam, heat or gas sterilization on the probe well. Do not autoclave the probe well.

As necessary, clean the inner and outer surfaces of the probe well by swabbing the surface with a cloth dampened with a mild detergent solution or a 70% isopropyl alcohol, or a 10% chlorine bleach solution, or a non-staining disinfectant.

NOTE:
Thoroughly dry all surfaces before re-assembling the monitor.

PNEUMATIC PRESSURE CHECK

A check of the monitor's pneumatic pressure system should be performed every six (6) months.

SAFETY CHECKS

The following Safety Checks should be performed at least every twelve (12) months by a qualified service technician.

- Inspect the equipment for mechanical and functional damage.

SYSTEM CHECKS

The following System Checks should be performed at least every twelve (12) months by a qualified service technician.

- All LEDs “ON” Check
- +12 Volt Power Supply Check
- System Pressure Checks
- Overpressure Check
- Temperature Calibration Check
- Oximetry Calibration Check
- Chassis Leakage

The following Electrical Safety Check should be performed any time the case is opened or patient isolation is in question.

- Hypot

BATTERY

CAS Medical Systems recommends replacing the monitor’s battery every two (2) years.

When the CASMED 740 Monitor is going to be stored for six (6) months or more, remove the battery prior to storage. To remove the battery, refer to Section *REPLACING THE MONITOR BATTERY*.

NOTE:
Batteries not charged and left in storage for more than six (6) months could degrade and not recharge to full capacity.

If the CASMED 740 Monitor has been stored for more than thirty (30) days, charge the battery as described in Section *BATTERY CHARGE*. A fully discharged battery requires four (4) hours to receive a full charge. The battery is being charged whenever the monitor is connected to a power source (AC Line Power or +12 VDC).

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10. TROUBLESHOOTING

SYSTEM TROUBLESHOOTING

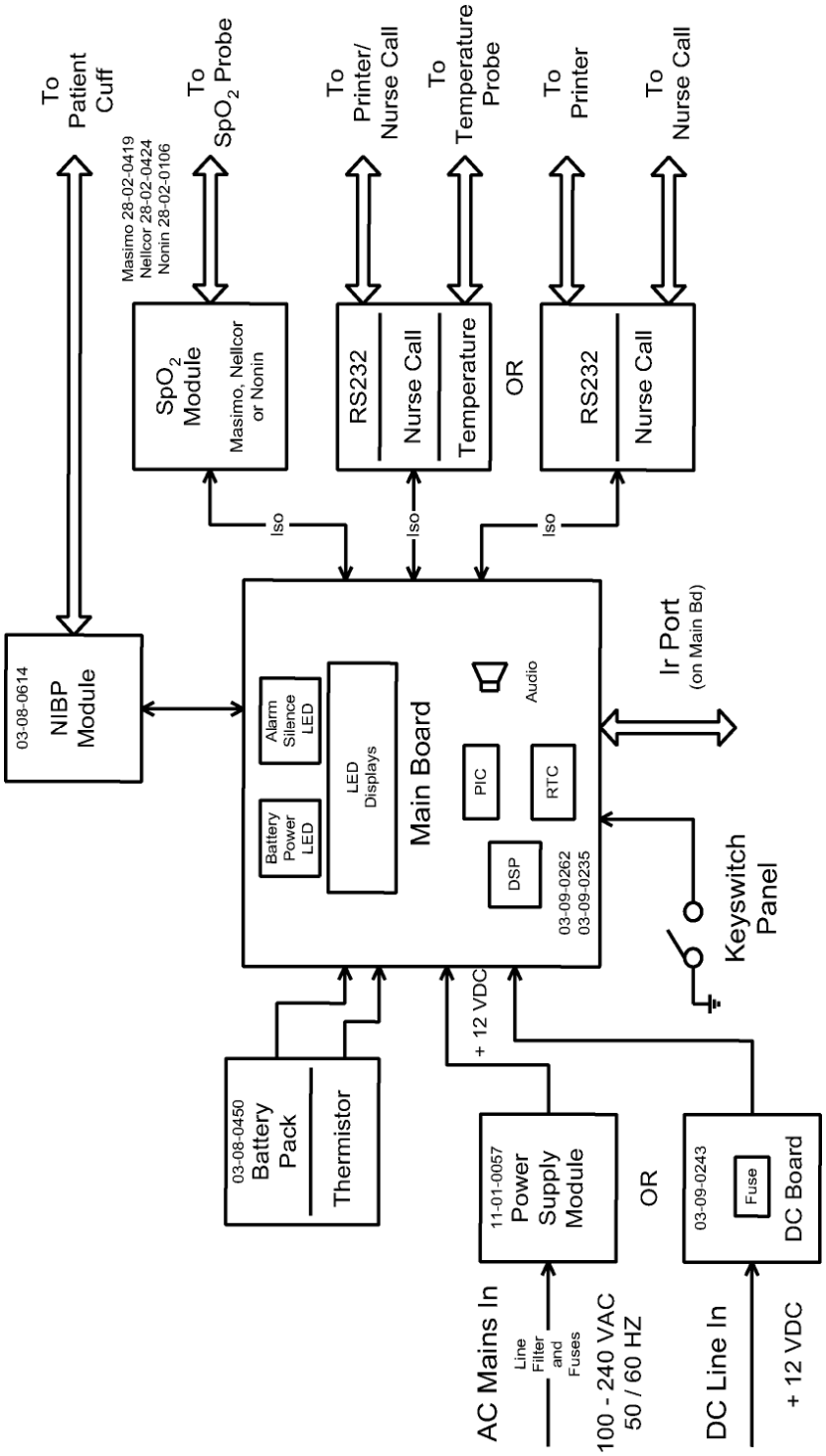

Figure 9: **Model 740 Monitor Overall Block Diagram**

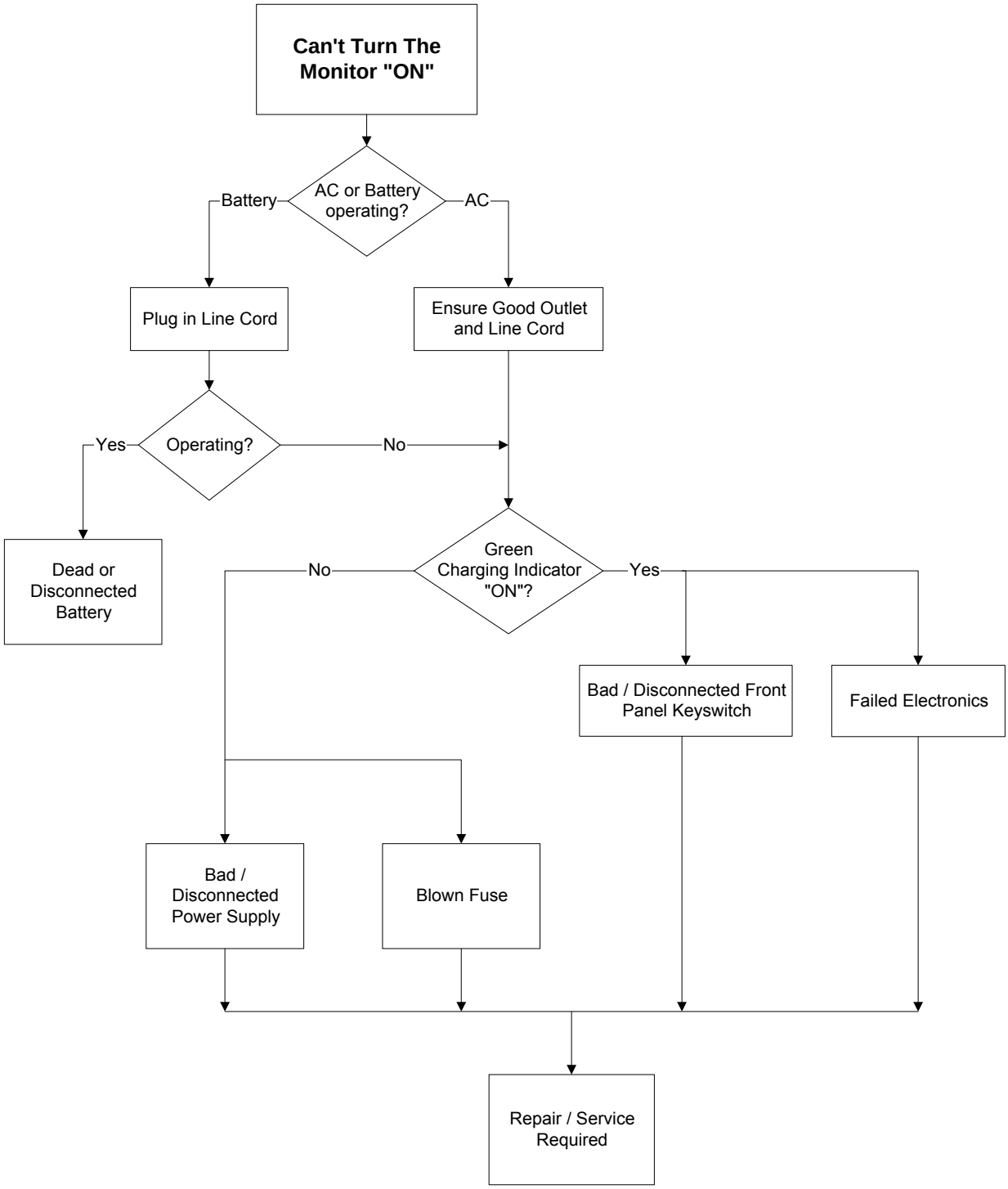

Figure 10: **No Monitor Power**

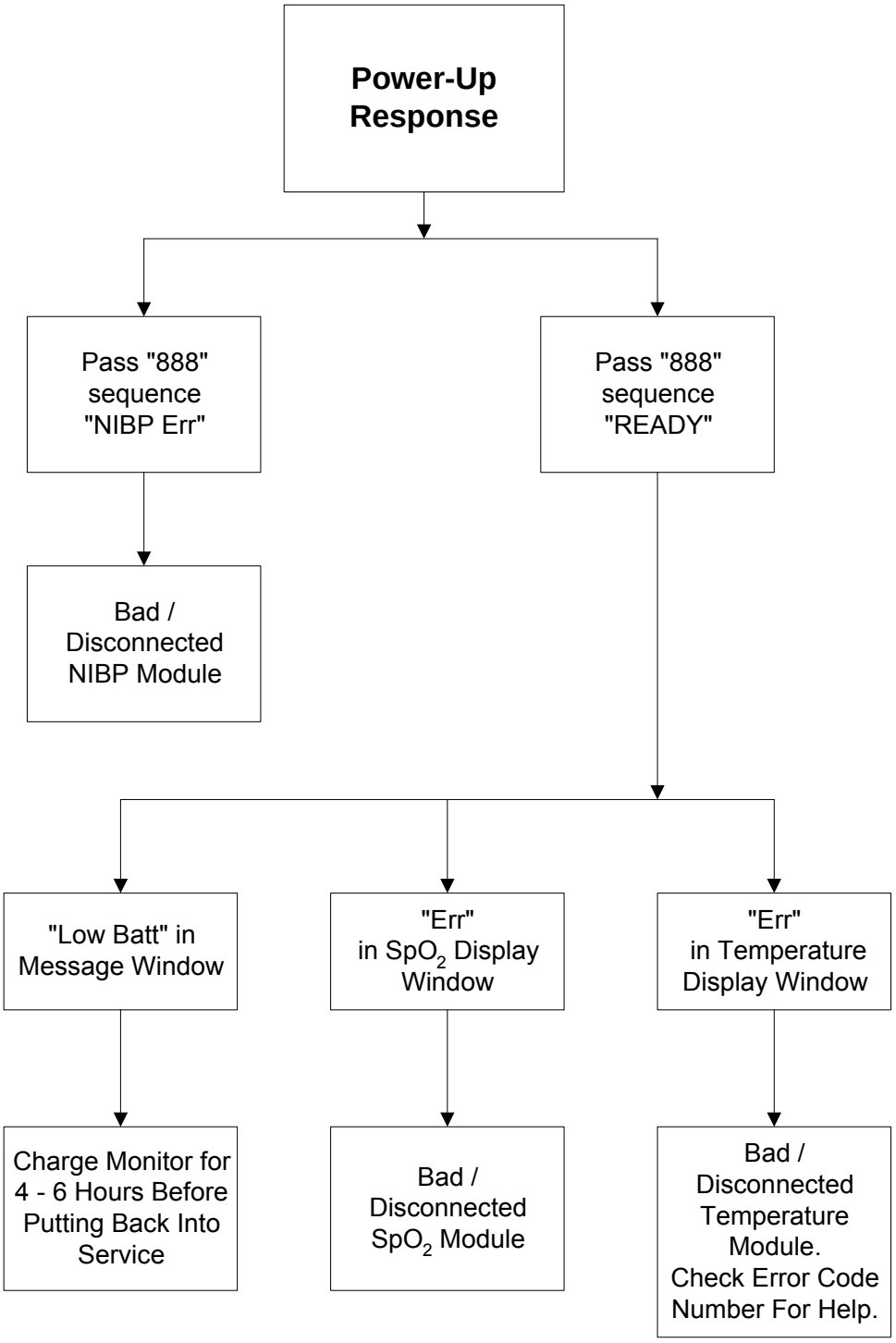
Power-Up Response
Pass "888" sequence "NIBP Err"
Pass "888" sequence "READY"
Bad / Disconnected NIBP Module
"Low Batt" in Message Window
"Err" in SpO_2 Display Window
"Err" in Temperature Display Window
Charge Monitor for 4 - 6 Hours Before Putting Back Into Service
Bad / Disconnected SpO_2 Module
Bad / Disconnected Temperature Module. Check Error Code Number For Help.

Figure 11: **Power Up Response**

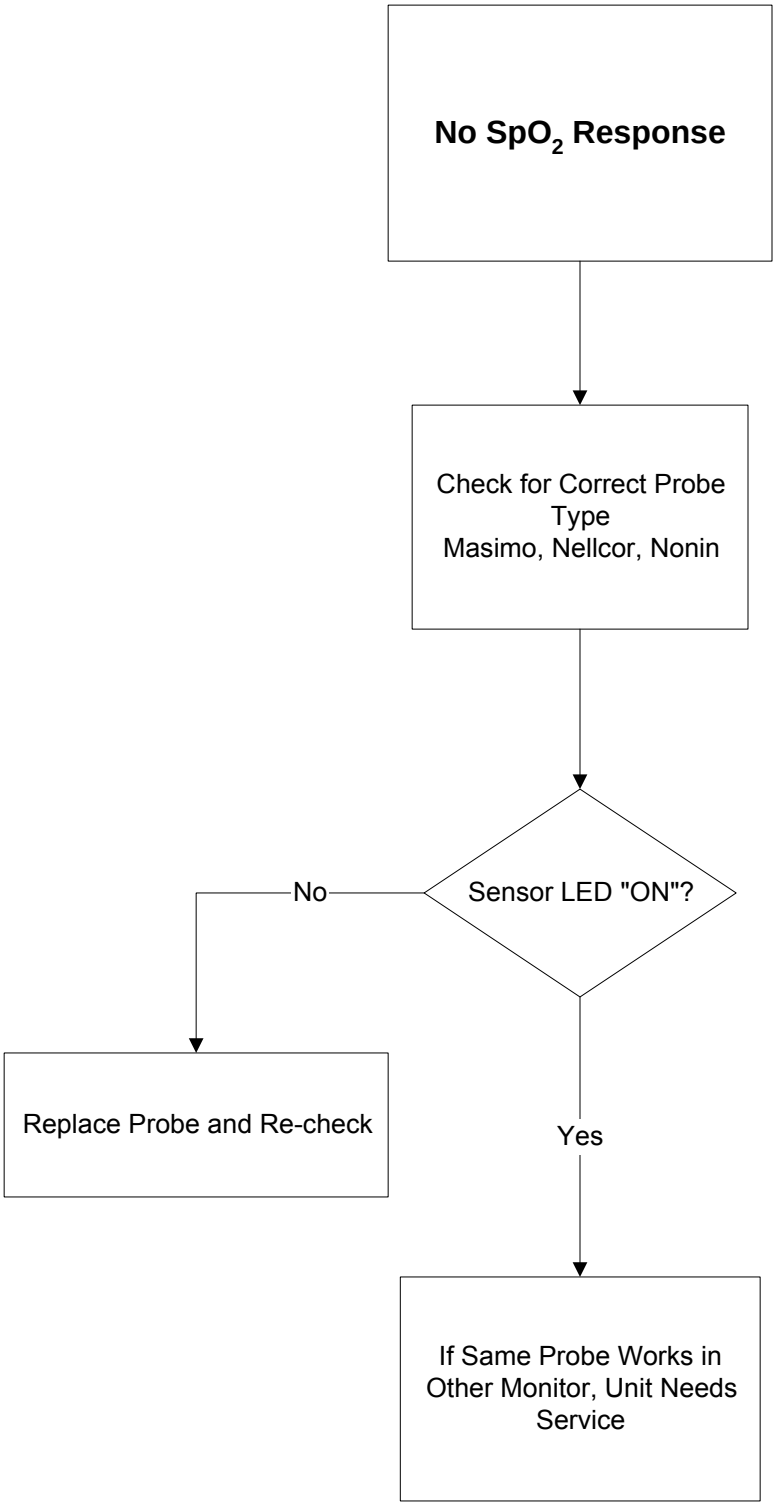

Figure 12: **SpO_2 Trouble Shooting**

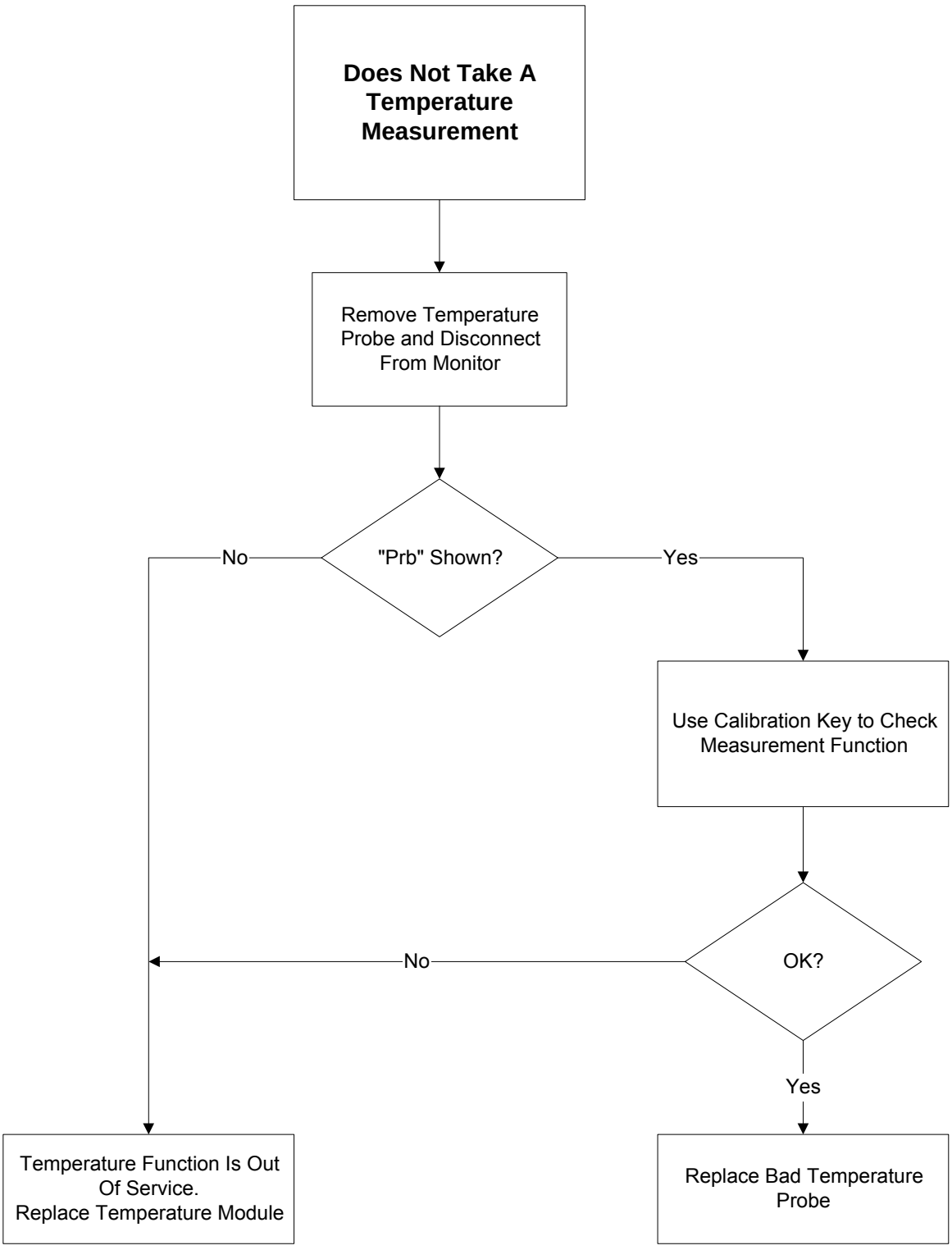

Figure 13: **Temperature Trouble Shooting**

THEORY OF OPERATION

The CASMED 740 Monitor's Main Control Board provides the following functions for the operation of the monitor.

- Power Supplies
- Battery Charger
- Supervisor Microcontroller (Microchip PIC 16F73)
    1. Indicator LEDs
    2. Temperature Monitoring
    3. Power Smart Module
    4. Power ON/OFF and Reset to Digital Signal Processor Controller
    5. Monitor ON/OFF
    6. Communication with Digital Signal Processor Controller
    7. Monitor Battery Charger and Battery conditions

- Digital Signal Processor Controller (Motorola DSP 56F827)
    1. SpO_2 Monitoring
    2. Blood Pressure Monitoring
    3. Keypad Monitoring
    4. Indicator LEDS and Displays
    5. Real-Time Clock
    6. Alarms
    7. Serial Interface

POWER SUPPLIES

The input to the 740 Main Control Board comes from either the DC input (J1) or the Battery Input (J2). A Control chip (U6) is responsible for selecting the monitor's main power source. The DC input, from the Power Supply, always takes priority over the Battery.

Battery 7.2 Volts @ 4.0 Ahr (TP7 to TP33)
DC 12 Volts @ 28 Watts (TP28 to TP29)

There are several supplies that are generated for internal use.

+Vpic TP5 The power supply for the Microchip PIC16F73 (U5), the Supervisor of the CASMED 740 Main Control Board.
The DC input or the Battery input, if there is no DC present, goes into a voltage regulator (U4) to supply the +3.3 volts.

+5V TP1 Power supply voltage for the main Analog and Digital circuitry.
The DC input or the Battery input, if there is no DC present, goes into a switching regulator (U1) to supply +5 volts. The regulator is turned on and off by the Microcontroller (U5).

+3.3V TP2 Chip I/O supply voltage for the DSP Controller (U20).
The +5 volts output of the switching regulator (U1) goes into a voltage regulator (U2) to supply the +3.3 volts.

+2.5V TP3 Core operating voltage for the DSP Controller (U20).
The +5 volts output of the switching regulator (U1) goes into a voltage regulator (U3) to supply the +2.5 volts.

+5V_ISO1 TP20 Isolated power supply for the Temperature Module circuit.
The +5 volts output of the switching regulator (U1) goes into a dc-dc converter (U17) to supply +5 volts to the Temperature Module circuit. The converter provides an isolation voltage of 2.5KV. The dc-dc converter is turned on and off by the DSP controller (U20) and transistor (Q12).

+5V_ISO2 TP8 Isolated power supply for the SpO_2 circuit.
The +5 volts output of the switching regulator (U1) goes into a dc-dc converter (U9) to supply +7 volts. The converter provides an isolation voltage of 2.5KV. The dc-dc converter is turned on and off by the DSP controller (U20) and transistor (Q7). The output of the converter feeds a +5 volt regulator (U22) that provides voltage for the SpO_2 board.

+5VCRG TP6 Power supply for the Battery Charger.
The DC input goes into a voltage regulator (U7) to supply the +5 volts.

+VND TP4 Power supply for the Blood Pressure pump.
The DC input or the Battery input, if there is no DC present, goes into a voltage regulator (U27) to supply the +6 volts. The voltage regulator is turned on and off by the DSP controller (U20) and transistors (Q16 and Q17).

BATTERY CHARGER
The battery charging is controlled by U8.

SUPERVISOR MICROCONTROLLER

The Microchip PIC16F73 (U5) is the supervisor of the Main Control Board. The controller has 4K of program flash, 192 bytes of data memory and operates from an external 153.6KHz crystal. The Microcontroller has 22 I/O's, 3 timers, 2 PWM/capture/compare modules, UART, SPI, and five (5) 8bit analog-to-digital channels.

Indicator LED's
LED1 is the power/low battery/charging indicator that is controlled by an output port of the Microcontroller (U5).

Temperature Monitoring (SureTemp®)
The Temperature module is an option that is plugged into J8 and J9 of the Main Control Board. The isolated power supply for the Temperature Module circuit (+5V_ISO1) is controlled by an output pin of the Supervisor (U5 pin 28). The Module is read by the Supervisor (U5) thru the serial port. The Temperature information is then sent to the DSP (U20) thru the SPI port.

Temperature Monitoring (SureTemp® Plus)
The Temperature module is an option that is plugged into J10 of the Main Control Board. The isolated power supply for the Temperature Module circuit (+5V_ISO1), on the RS-232/Temp I/F board, is controlled by an output pin of the Supervisor (U5 pin 28). The Module is read by the Supervisor (U5) thru the serial port. The Temperature information is then sent to the DSP (U20) thru the SPI port.

Power Smart Module
The Power Smart Module option comes into the Main Control Board at J2 (pins 2 and 3). The Power Smart Module is read by the Supervisor (U5 pins 25 and 26) then sent to the DSP (U20) thru the SPI port.

Power ON/OFF and Reset to Digital Signal Processor Controller
The Power switch comes into the Main Control Board at keypad connector J6. It is read as an input pin to the Supervisor (U5 pin 21).

The Supervisor has an output pin (U5 pin 7) that controls the reset to the DSP (U20).

Monitor ON/OFF (+5V ENABLE)
The monitor turning on and off is control by an output pin of the Supervisor (U5 pin 11) and associated components Q1 and Q2.

Communication with Digital Signal Processor Controller
The Supervisor (U5) has two-way communication to the DSP (U20) using a dedicated SPI line.

Monitor Battery Charger and Battery Conditions
The DC input and Battery inputs are read by two analog to digital converter of the Supervisor (U5 pins 2 and 3). The results of these signals are used to control the Low and Dead Battery conditions of the monitor and the status of the front panel Power / Charging LED (LED 1).

Two output lines from the Battery Charger Control chip (U8) are read by the Supervisor (U5 pins 23 and 24). The information from these pins informs the Supervisor the status of the charging condition (fast charge, trickle charge or hold off). All of the information is sent from the Supervisor to the DSP (U20) thru the SPI port.

DIGITAL SIGNAL PROCESSOR CONTROLLER

The Motorola DSP56F827, is Digital Signal Processor (DSP U20) and is the Main Controller of the CASMED 740 Monitor. The controller has 64K of program flash, 4K of data flash, 1K program ram, 4K of data ram and operates off an external 4 MHz crystal. The DSP features are PLL, 2 SPI ports, TOD, watchdog timer, quad timer, 16 dedicated I/O, 48 shared I/O, 64 muxed I/O, interrupt controller, 8 programmable chip selects and 32 external bus signals.

SpO_2 Monitoring
The SpO_2 Module is an option that is plugged into the Main Control Board, J3 for Nellcor and Nonin or J5 for Masimo. The isolated power supply for the SpO_2 Module circuit (+5V_ISO2) is controlled by an output pin of the DSP (U20 pin 37). The Module is read by the DSP (U20) thru the serial port (TXD2 and RXD2) and associated components (U10, Q9, Q10, ISO1 and ISO2). The power is turned off when the SpO_2 option is not installed.

Blood Pressure Monitoring
The Blood Pressure Module is plugged into J4 of the Main Control Board. The power (+VND) of the Blood Pressure Module is controlled by an output pin of the DSP (U20 pin 36). The Blood Pressure Module is read by the DSP (U20) thru the serial port (TXD1 and RXD1).

Keypad Monitoring
The keypad comes into the Main Control Board at J6. There are eight keys are read as inputs by the DSP (U20 pins 116 - 124). The keys are normally high and active low when the switch is pressed.

Indicator LED'S and Displays
U11, U13, U14, U15 and U16 are seven segment LED driver IC's that are controlled thru the SPI port of the DSP (U20). They are used to display Temperature, Diastolic, MAP, %SpO_2, Systolic, BPM, SpO_2 bar graph, ADULT led, NEO led, TEMP led, Silence led and the two slash led's. U12 is an eight character smart alphanumeric display (Message Window) that is driven by the DSP (U20) directly.

Real-Time Clock
The real-time clock (U21) is controlled by the DSP (U20) thru the SPI port. The part has it own battery and internal crystal. The battery can be replaced separately when needed.

Alarms
The alarms circuit has an audio attenuator (U23), an amplifier (U24) and a speaker (LS1). The sound is controlled by the DSP (U20).

Serial Interface
The serial input/output goes into the Main Control Board on J10. The serial port is controlled by the DSP (U20).

ERROR MESSAGES

The CASMED 740 Monitor displays a variety of messages to aid the user in monitor operation. If a troubleshooting message is displayed during a measurement, follow the actions listed to correct the situation.

If the monitor does not turn on, or exhibits a flashing display and failure to operate, the battery is most likely below the Dead Battery point. Connect the monitor to a power source (AC Line Power or +12 VDC) and allow it to charge for four (4) hours.

If the monitor is in need of repair, it must be referred to the appropriate service personnel. Service performed by unauthorized personnel could be detrimental to the monitor and will void the warranty. For service, contact your dealer or CAS Medical Systems, Inc.

SpO_2 USER MESSAGES

(available if SpO_2 is installed)

If the accuracy of any measurement does not seem reasonable, first check the patient's vital signs by an alternate method.

NOTE:

The SpO_2 probe must be kept as motionless as possible to make a proper determination. Use the SpO_2 strength bar graph to determine if a strong rhythmic pulse signal is present.

When no oximeter probe is attached to the monitor, the $\%SpO_2$ window and signal strength window will be blank. When no SpO_2 pulse data is available, the monitor will display the last NIBP pulse.

When the probe is connected to the monitor, but is off of the patient, the message "–" is displayed in the $\%SpO_2$ and Pulse Rate windows. The Message Window flashes the message "Prb OFF" and three (3) audio "beeps" are heard every twenty-five (25) seconds.

Press the SILENCE/RESET pushbutton. The monitor silences the audible alarm tone, but the message remains.

If the message "Prb" should appear in the $\%SpO_2$ window, verify that the probe being used is the correct one for the monitor's SpO_2 configuration (Masimo, Nellcor, Nonin) or that the probe is not defective. Press the SILENCE/RESET pushbutton. The monitor silences the audio alarm tone, but the message remains. Remove the defective probe and replace it with a working probe.

If the SpO_2 Module located inside the CASMED 740 Monitor should fail, the message "Err" will appear in the $\%SpO_2$ display window. Press the SILENCE/RESET pushbutton. The monitor silences the audio alarm tone, but the message remains.

Should any of the above problems persist, contact your dealer or CAS Medical Systems, Inc.

TEMPERATURE USER MESSAGES
(available if Temperature is installed)

If the probe becomes unattached to the CASMED 740 Monitor's rear panel connector, the message "Prb" is shown in the TEMP display window.

NOTE:
Press the SILENCE/RESET pushbutton to clear the TEMP display.

If the Temperature probe well is removed from the top of CASMED 740 Monitor's Temperature module, the message "Prb" is shown in the TEMP display window.

NOTE:
Press the SILENCE/RESET pushbutton to clear the TEMP display.

When an attached probe is removed from the probe holder, the message OrL, ALy or rEC is shown briefly in the TEMP display window indicating the predictive algorithm is being used by the Temperature function.

When the message "Err XX", where "XX" is an Error Number, is displayed in the TEMP display window an error condition has occurred and a reliable temperature reading could not be obtained.

NOTE:
Press the SILENCE/RESET pushbutton to clear the TEMP display.

Refer to Table 5: SureTemp® Temperature Error Codes or Table 6: SureTemp® Plus Temperature Error Codes for more information.

Verify the monitor's operating environment is within its limits and start the procedure from the beginning.

ERROR	CLASS	ERROR DESCRIPTION
00		Transmit buffer overflow
01	Probe	Probe heater energy accumulation too high
02	Probe	Probe a/d pulse width out of range
03	Probe	Adaptive probe gain too high or too low
11	Ambient	Ambient temperature above 104 °F
12	Ambient	Ambient temperature below 60.8 °F
21	Module	Battery voltage below error threshold of 3.0 volts
31	Module	RAM read/write error
32	Module	ROM checksum error
33	Module	CPU instruction error
40	Module	PTB resistor a/d pulse width out of range
41	Module	RatioCal resistor a/d pulse width out of range
42	Module	External ambient thermistor a/d pulse width out of range
50	Module	Heater circuit failure
51	Module	Probe heated above 112 °F
52	Module	Heater watchdog timeout failure
60	Module	PTB resistor “temperature” out of rang
99	Configuration	Temperature option no longer recognized

Table 5: **SureTemp® Temperature Error Codes**

Should any of these problems persist, contact your dealer or CAS Medical Systems, Inc.

ERROR	CLASS	ERROR DESCRIPTION
21	Probe	Defective probe tip where heater is too close to thermistor
22	Probe	Excessive heater energy, heater not working
24	Ambient	Ambient temperature too high
25	Ambient	Ambient temperature too low
27	Voltage	Power Supply voltage exceeds algorithm max value
28	Voltage	Power Supply voltage below algorithm min value
32	Probe	Thermistor pulled away from the tip or heater broken
33	Probe	Probe not responsive, not characterized/calibrated
34	Probe	Probe not characterized/calibrated
45	Prb/Mod/Pat[1]	Measurement below allowable temperature values
46	Prb/Mod/Pat	Measurement above allowable temperature values
47	Module	Internal calibration resistor in module is damaged
48	Module	Internal calibration resistor in module is damaged
49	Module	Internal circuit validation resistor in module is damaged
50	Module	Internal circuit validation resistor in module is damaged
51	Module	A/D measurement timed out
52	Probe	Probe not characterized/calibrated
59	Voltage	Power Supply voltage below algorithm max value

[1] Prb/Mod/Pat indicates class could Probe, Module or Patient

ERROR	CLASS	ERROR DESCRIPTION
60	Voltage	Power Supply voltage exceeds algorithm min value
61	Module	Reference voltage under voltage or unstable
65	Module	Problem saving to the Module's EEPROM
66	Module	Module or Probe error detection mechanism error
67	Module	Problem reading or saving to Module's EEPROM
68	Module	Problem reading or saving to Module's EEPROM
69	Module	Problem reading or saving to Module's EEPROM
70	Probe	Problem reading the probe's EEPROM
74	Module	Internal Error, EEPROM not initialized
75	Probe	Cannot read probe's EEPROM correctly
80	Module	Problem with turning probe heater off
81	Module	Problem with turning probe heater on
82	Module	Internal error
83	Module	Internal error
84	Module	Internal error
85	Module	Heater hardware fail safe error

Table 6: **SureTemp® Plus Temperature Error Codes**

Should any of these problems persist, contact your dealer or CAS Medical Systems, Inc.

MISCELLANEOUS TEMPERATURE TROUBLESHOOTING

CASMED 740 monitors using SureTemp temperature incorporate a microswitch located inside the RS232/Temperature module which signals the start of a temperature cycle. Over time, this mechanical switch may become intermittent causing the user to take multiple tries to start a reading. The switch should be replaced when a complaint of intermittent temperature readings is received.

According to the manufacturer of the temperature technology used in the CASMED 740 monitor, the life expectancy of the temperature probe is 6000 cycles. Depending on its usage and to prevent future temperature problems, it is recommended to replace the probe at this interval.

When taking multiple readings in a row, the manufacturer of the temperature technology recommended waiting three (3) minutes in between readings.

ERROR MESSAGES ON THE MESSAGE WINDOW

The CASMED 740 Monitor displays a variety of messages on the Message Window to aid the user.

ERROR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"Air Leak"	Air leak in cuff/hose/monitor pneumatic system.	Check that the cuff/hose/monitor connection is secure. Check cuff for leaks. Do not use a known leaky cuff.
“Appl Err“	Neonate cuff is detected in Adult Mode.	Check cuff. Replace cuff or change operating mode
“Chk Prb” (Masimo)	The monitor is questioning the quality of the signal being received by the SpO_2 sensor. The sensor is receiving too much ambient light.	Verify that the sensor is being used according to the manufacturer’s recommendations. Verify that the sensor emitter and detector are parallel to and directly opposing each other.
“ChksumEr”	An electronic failure has occurred within the monitors’ Main Control Board.	Contact CAS Medical Systems to have the monitor serviced.
"Dead Bat"	The battery is fully discharged.	Recharge the battery for at least 4 hours.
"Flow Err"	Stable cuff pressure cannot be maintained by the pneumatic system.	Check the external tube for kinks. Perform a Pneumatic Check as detailed in the Maintenance section of this manual. Replace cuff.
"LooseCuf"	Cuff applied too loosely.	Check cuff for proper fit on patient.
"Low Batt"	The battery is almost discharged.	At least 30 minutes of operation is available from when the message first appears. Recharge the battery as soon as possible.
"Low Perf" (Masimo)	The perfusion level being received by the SpO_2 sensor is low.	Determine if an extreme change in the patient’s physiology and blood flow at the monitoring site occurred (e.g. an inflated blood pressure cuff, a squeezing motion). Try to warm the patient or sensor site. Move sensor to a site with better perfusion.

Table 7: **Error Messages on the Message Window**

ERROR MESSAGES ON THE MESSAGE WINDOW (cont.)

ERROR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"Motion"	There was too much extremity motion for the monitor to accurately complete the NIBP measurement in 120 seconds.	Measurements can be obtained when there is limited extremity movement, but the measurement time may be extended. Measurement time is limited to 120 seconds. Restrain patient extremity motion.
"NBP Cal"	Pressure calibration data corrupted within NIBP module.	Pressure module needs recalibration. Contact CAS Medical Systems to have the monitor serviced.
"NIBP Err"	An electronic failure has occurred within the NIBP module.	Contact CAS Medical Systems to have the monitor serviced.
“No Probe”	The monitor is not detecting the SpO_2 probe.	The probe was disconnected from either the Interface Cable or from the monitor.
"OverPres"	Cuff pressure exceeded 290 mmHg in the Adult mode or 145 mmHg in the Neonatal mode.	Very rapid squeezing of the cuff can cause this error. Repeat the measurement. If this message repeatedly occurs during normal use, the monitor must be serviced.
“P Search”	The monitor is searching for a Pulse signal.	Normal at power-up as the monitor searches for a pulse. The probe position may have changed. Check the probe site.
“Prb OFF”	The monitor is no longer receiving a patient signal from the SpO_2 probe.	The probe is no longer in contact with the patient. Check the probe site.
"Pwr Fail"	Power was disconnected from the monitor.	Press the SILENCE/RESET pushbutton to clear the message. OR Re-cycle the monitor’s power.

Table 7: **Error Messages on the Message Window**

ERROR MESSAGES ON THE MESSAGE WINDOW (cont.)

ERROR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"RangeErr"	The systolic reading exceeds the measurement range of 255 mmHg in the Adult mode or 135 mmHg in the Neonatal mode.	Repeat measurement. If the message is displayed again, use another method to measure the patient's blood pressure.
"SetClock"	The monitor's clock needs to be set.	The monitor's time and date values are incorrect. Refer to sections: *SETTING THE DATE* and *SETTING THE TIME* for more information. The monitor's internal clock battery needs to be replaced. Contact CAS Medical Systems.
"Signal ?" (Masimo)	The quality of the signal level being received by the SpO_2 sensor is in question.	Ensure proper sensor type and application. Verify that the sensor emitter and detector are parallel to and directly opposing each other. Clean or replace the sensor.
"Sig Sat"	Motion pulses too strong.	Limit patient activity; the arm must be still and/or relaxed. Repeat measurement.
"Sys Err"	An electronic failure has occurred within the monitor.	Contact CAS Medical Systems to have the monitor serviced.
"Time Out"	The monitor was unable to complete a measurement within 120 seconds in the Adult mode or 90 seconds in the Neonatal mode.	An extremely long measurement can be due to a loose cuff, high blood pressure, or monitor re-pumps. Try measurement again. Try higher initial pressure. If message consistently reappears try using another means to obtain patient's blood pressure.
"Weak Sig"	The monitor did not detect any pulses during a NIBP measurement.	Check the fit of the cuff. Repeat measurement.

Table 7: **Error Messages on the Message Window**

11. MAINTENANCE PROCEDURES

INTRODUCTION

This section discusses the tests used to verify performance following repairs or during routine maintenance. All tests can be performed without removing the CASMED 740 Monitor's cover.

If the CASMED 740 Monitor fails to perform as specified in any test, repairs must be made to correct the problem before the monitor is returned to the user.

EQUIPMENT REQUIRED

To test the NIBP

- P9 Calibration Kit
- Mercury Manometer
- NIBP Simulator
- 500 mL Pressure Cylinder (CAS p/n 01-02-0248)

To test the Temperature

- Temperature Calibration Key
  (CAS p/n 01-02-0095-SureTemp) or (01-02-0455-SureTemp Plus)

To test the SpO_2

- SpO_2 Finger Sensor Simulator

To perform Electrical Safety

- Electrical Safety Analyzer
- Hypot Tester

Data Sheet

This procedure uses a Data Sheet as the record for verifying monitor performance. Once the procedure is completed, CAS recommends the Data Sheet be kept with the respective monitor's Device History Record should verification of monitor performance be questioned.

The *DATA SHEET* can be found on page 87.

BATTERY CHARGE

Perform the following procedure to fully charge the battery.

1) Connect the monitor to an AC power source.
2) Verify that the monitor is “OFF” and that the Battery Power Visual Indicator is lit Green.
3) Charge the battery for at least four (4) hours.

TURNING THE CASMED 740 MONITOR “ON”

Perform the following procedure to verify the CASMED 740 Monitor powers “ON” properly.

1) Connect the monitor to an AC power source.
2) Verify that the monitor is “OFF” and that the Battery Power Visual Indicator is lit Green.
3) Do not connect any cables to the monitor.
4) Press the ON/STANDBY pushbutton on the front panel to turn the monitor “ON”.

Upon applying power to the monitor, the CASMED 740 Monitor displays a one (1) second Configuration Setup Test and conducts a four (4) second electronic Power On Self-Test (POST) to ensure that its internal circuits are functioning properly.

NOTE:
The user should use the Power On Self Test as a verification tool that all front panel visual indicators and the audio are functioning properly.

The one (1) second Configuration Setup Test is a visual indication of the CASMED 740 Monitor’s current configuration. It consists of the monitor’s Model number and a description of its power source (740 or 740M), an Installed Parameter Code (1, 2, 3) and a one (1) or two (2) character module configuration code.

As an example, upon power-up the CASMED 740 Monitor displays: 740-2MS.

- The first set of characters indicates the Model number and the source of its power supply (740 = Internal/AC Line Power or 740M = DC connection).
- The second character (2) describes how many parameters are installed in the monitor. The monitor in our example is configured for NIBP and SpO_2. Installed Parameter Codes include;
  - (1) = NIBP; (2) = NIBP and SpO_2 or Temperature; (3) = NIBP, SpO_2 and Temperature
- The third set of characters (MS) describes the type of module installed. The monitor in our example is configured for Masimo oximeter. Configuration Codes are;
  - MS = Masimo; NL = Nellcor; NN = Nonin; T = Temperature

The four (4) second Power On Self-Test consists of:

- All equipped parameter segments are lit for one (1) second.
- All High Alarm Values are displayed for one (1) second in their corresponding numeric display window and an audible tone is emitted from the monitor's internal speaker. The Message Window indicates "HI LIMS".
- All Low Alarm Values are displayed for one (1) second in their corresponding numeric display window and an audible tone is emitted from the monitor's internal speaker. The Message Window indicates "LO LIMS".
- The monitor's current time is displayed for 1 second.

Once the test is completed, the monitor indicates that it is "Ready" for use.

DISPLAYING THE TIME

Perform the following procedure to verify the time is set correctly.

1) Press and hold the CYCLE TIME pushbutton for two (2) seconds.
2) The monitor displays the time, in 24 Hr. format in the Message Window for as long as the pushbutton is pressed.
3) Should the time being displayed not be correct, refer to Section SETTING THE TIME.

ALARM AUDIO

Perform the following procedure to verify the audio range for the Alarm volume.

1) Press the VOLUME pushbutton on the front panel. Verify a Key Click tone is heard and the Message Window displays "ALARM ".
2) Press the VOLUME UP and VOLUME DOWN pushbuttons and verify the Alarm Volume can be adjusted to one of five volume levels.
3) Set the volume level as desired.
4) Press the STOP pushbutton when completed.

NOTE:
The Alarm Volume level cannot be set to "OFF".

NOTE:
No Key Click will be heard when the Audio Alarm Volume is set to a MINIMUM setting.

SpO_2 AUDIO
(available if SpO_2 is installed)

Perform the following procedure to verify the audio range for the SpO_2 volume.

1) Press the AUDIO pushbutton twice. Verify a Key Click tone is heard each time and the Message Window displays "SpO2 ".
2) Press the VOLUME UP and VOLUME DOWN pushbuttons and verify the SpO2 "beep" volume can be adjusted to one of five volume levels and "OFF".
3) Set the volume level as desired.
4) Press the STOP pushbutton when completed.

CONFIGURATION MODE TESTS

Perform the following procedures to verify the following system operations of the monitor.

NOTE:
The monitor must be in the Configuration Mode in order to perform the following functions.

- All LEDs "ON" Check
- +12 Volt Power Supply Check
- Calibration Check
  - System Pressure
  - Over Pressure
- Pneumatic Pressure Checks
- Temperature Calibration Check

ENTERING THE TEST MODE

To enter the monitor's Configuration Menu, press and hold the ALARM LIMITS and VOLUME pushbutton keys while the monitor is being turned "ON".

Once in the menu, press one of the *PREVIOUS* (CYCLE TIME / ALARM LIMITS) programmed pushbutton keys until the Message Window briefly displays "Test Mode" followed by "0 mmHg".

NOTE:
While in the Test Mode if no pushbutton is pressed within 15 minutes, the monitor will automatically terminate the Configuration menu and return to the "Ready" mode.

WARNING:
Do not place the monitor in the TEST MODE when a cuff is attached to a patient.

EXIT THE TEST MODE

When you have completed with the Test Mode, press the STOP pushbutton to exit. The Message Window will briefly display “Saving” and return to the “Ready” state.

LED CHECK

Perform the following procedure to verify the functionality of all front panel LED displays and visual indicators.

1) Enter the Test Mode. The Message Window will briefly display “TEST MODE” followed by "0 mmHg".
2) Press and hold either the ARROW UP or ARROW DOWN pushbuttons.
3) The monitor will illuminate all appropriate 7-segment displays, bar graph, bell icon and patient mode indicators for as long as the button is pressed.

+12 VOLT POWER SUPPLY CHECK

Perform the following procedure to verify the proper DC input voltage to the Main Control Board.

1) Enter the Test Mode. The Message Window will briefly display “TEST MODE” followed by "0 mmHg".
2) Press and hold the SILENCE/RESET pushbutton.
3) The monitor will display the input voltage (VDC) reading in the Message Window. Verify the value to be 12 +/- 0.50 V.

CALIBRATION CHECK

A Calibration Kit, (product #P9) is included with the monitor. The kit contains a T-connector with a male and a female luer fitting (for a Calibration Check) and a male luer plug (to be used for the Pneumatic Check).

Obtain a mercury manometer whose accuracy meets the AAMI/ANSI Standard for Non-Automated Sphygmomanometers, 2002.

NOTE:
The monitor must be in the Adult mode prior to performing these pressure checks.

SYSTEM PRESSURE

Assemble the Calibration Kit according to the diagram provided in the P9 kit.

1) Remove the manometer tubing from the inflation bulb. Connect the open ended tubing of the T-connector to the inflation bulb.
2) Connect the female luer fitting to the inflation tube leading to the manometer.
3) Connect the male luer fitting to the manometer tubing.
4) Enter the Test Mode. The Message Window will briefly display “TEST MODE” followed by "0 mmHg".
5) Use the manometer inflation bulb to slowly inflate the system pausing for 30 seconds at the following points and verify calibration according to the following table:

0 mmHg +/- 1 mmHg

50 mmHg +/- 4 mmHg

100 mmHg +/- 4 mmHg

150 mmHg +/- 4 mmHg

200 mmHg +/- 5 mmHg

NOTE:
If the monitor does not display the test pressure for the 30-second period, deflate to zero and verify the proper assembly of the calibration set-up. Re-inflate the system. If the monitor again fails to hold the pressure, it is recommended the monitor be returned to CAS Medical Systems for service.

OVERPRESSURE

1) Inflate the pressure slowly until 290 mmHg +/- 10 mmHg is reached. The Message Window should stop updating, display the message "OverPres" and provide a NIBP Application Error audible tone.
2) Press the STOP pushbutton to exit the Overpressure Test. The monitor returns to the Calibration Check function.
3) If the monitor does not meet the above specifications, it is recommended the monitor be returned to CAS Medical Systems for service.

PNEUMATIC PRESSURE CHECKS

PLUG TUBE

Obtain the male luer plug found in the Calibration Kit (product #P9) supplied with the monitor.

1) Place this plug into the cuff connector at the end of the monitor inflation hose and twist one-quarter turn. The plug must fit securely into the connector for this test to be performed properly.
2) Enter the Test Mode. The Message Window will briefly display “TEST MODE” followed by "0 mmHg".
3) Press the START pushbutton to begin the Pressure Check.
4) The Message Window will display “Chk Prs”, will inflate to approximately 180 mmHg and attempt to hold this pressure. The pressure value will be displayed in the SYSTOLIC display window. This test takes about fifteen (15) seconds.
5) At the completion of a successful Pressure Check, the Message Window will display “Passed”; the monitor will beep two (2) times and will return to the Calibration Check function after five (5) seconds.
6) If the monitor fails the Pressure Check, the Message Window will display "Leak", the monitor will beep three (3) times and will return to the Calibration Check function after five (5) seconds.

Due to the volume differences of the hoses offered with the CASMED 740 Monitor, the monitor may incorrectly fail the Plug Tube check. Should the monitor fail the Plug Tube Pressure Check, obtain a 500 ml Pressure Cylinder and follow the 500 ml Pressure Check.

500 ml PRESSURE CHECK

Obtain a fixed volume 500 ml Pressure Cylinder (CAS p/n 01-02-0248).

1) Place the end of the monitor’s inflation hose securely onto the luer fitting at the top of the pressure cylinder. The hose must fit securely onto the connector for this test to be performed properly.
2) Enter the Test Mode. The Message Window will briefly display “TEST MODE” followed by "0 mmHg".
3) Press the START pushbutton to begin the Pressure Check.
4) The Message Window will display “Chk Prs”, will inflate to approximately 160 mmHg and attempt to hold this pressure. The pressure value will be displayed in the SYSTOLIC display window. This test takes about fifteen (15) seconds.
5) At the completion of a successful Pressure Check, the Message Window will display “Passed”, the monitor will beep two (2) times and will return to the Calibration Check function after five (5) seconds.

6) If the monitor fails the Pressure Check, the Message Window will display "Leak", the monitor will beep three (3) times and will return to the Calibration Check function after five (5) seconds.

Should the monitor fail the 500 ml Pressure Check, it is recommended the monitor be returned to CAS Medical Systems for service.

NIBP SIMULATOR CHECK

1) Exit the Test Mode and connect the CASMED 740 Monitor to a NIBP Simulator.
2) Set the simulator to a pressure value of 120/80, 40 bpm, 100% gain.
3) Press the START pushbutton and allow the monitor to take the NIBP measurement.
4) Take a total of four (4) NIBP readings. Disregard the first and average the remaining together.
5) Verify the NIBP values, displayed on the monitor's front panel, to be within +/- 5 mmHg and the Pulse Rate to be within +/-2% or +/-2 BPM, whichever is greater.

NOTE:
Results may vary based on the NIBP Simulator being used.

TEMPERATURE CALIBRATION CHECK

To perform a Temperature Calibration Check, obtain a Calibration Key. This key can be purchased directly from Welch Allyn or CAS Medical Systems. Refer to the SPARE PARTS section for part number information.

NOTE:
The Temperature Calibration Check can be performed, at any time, once the monitor enters the Configuration Menu.

1) Turn the monitor "OFF".
2) Remove the temperature probe and its connector completely from the monitor and insert the Calibration Key.
3) Turn the monitor "ON", and enter the monitor's Configuration Menu.
4) Re-insert and remove the temperature probe from the probe guide to reset the thermometer's electronics. An audible "click" should be heard when the SureTemp® probe is completely placed into its holder. The SureTemp® Plus probes will slide in and out of the Probe Well without any restrictions.
5) Wait for the test to complete, and observe the display reading in the TEMP display window.
6) The display value should read 36.3 +/- 0.1°C or 97.3 +/-0.1°F.

NOTE:
The monitor will display the Temperature Calibration Key value using the current temperature units selected.

NOTE:
The Temperature Calibration Key will only operate while the monitor is in the Configuration Menu. If the Calibration Key is inserted during normal monitoring, the TEMP display will show three (3) flashing dashes "- - -" and no value will be displayed.

NOTE:
While in the Configuration Menu, if no pushbutton is pressed within 60 seconds, the monitor will automatically exit the Configuration menu. The Message Window will briefly display "Saving" and return to the "Ready" mode.

7) Remove the Calibration Key and re-insert the temperature probe connector.

8) Install the temperature probe into the probe holder. An audible "click" should be heard when the SureTemp® probe is completely placed into its holder. The SureTemp® Plus probes will slide in and out of the Probe Well without any restrictions.

OXIMETRY CALIBRATION CHECK

The oximeter is factory calibrated to determine the percentage of arterial oxygen saturation of functional hemoglobin. No user calibration is required.

SpO_2 SIMULATOR CHECK

1) Exit the Test Mode and connect the CASMED 740 Monitor to a SpO_2 Simulator of the appropriate type.

2) Set the simulator to a SpO_2 value of 98% and a Pulse Rate of 60 BPM.

3) Verify the $\%SpO_2$ reading, displayed on the monitor's front panel, to be within +/- 2% digits and the Pulse Rate to be within +/- 3 BPM.

ELECTRICAL SAFETY CHECKS

WARNING:
Do not touch the monitor when performing these tests.

LEAKAGE

1) Disconnect all accessories from the monitor.

2) Plug the AC power cord from the CASMED 740 Monitor into the Electrical Safety Analyzer.

3) Turn the CASMED 740 Monitor "ON".

4) Perform a Leakage Check per manufacturer's instructions. Verify the monitor's leakage to be ***less*** than 100 micro-amps.

HYPOT (Monitor)

NOTE:
CAS Medical Systems recommends a Hypot Electrical Safety Checks be performed each time the monitor's case is opened or patient isolation is in question.

WARNING:
Do not touch the monitor when performing this test.

1) Disconnect all accessories from the monitor.
2) Plug the AC power cord from the CASMED 740 Monitor into the Hypot Tester.

WARNING:
Do not turn the monitor "ON" during a hypot test.

3) Perform a Hypot Test, per manufacturer's instructions for one (1) minute, at 2.5 KV.
4) Verify that there was no arching observed.

HYPOT (SpO_2)

WARNING:
Do not touch the monitor when performing this test.

1) Connect the appropriate SpO2 probe and/or cable to the monitor.
2) Plug the AC power cord from the CASMED 740 Monitor into the Hypot Tester.
3) Connect a lead wire from the Ground terminal of the Hypot tester to the SpO2 probe.

WARNING:
Do not turn the monitor "ON" during a hypot test.

4) Perform a Hypot Test, per manufacturer's instructions for one (1) second, at 1.8 KV.
5) Verify that there was no arching observed.

Disconnect the monitor from the test equipment.

This concludes the testing to the CASMED 740 Monitor.

DATA SHEET

Date: _____

Tested By: _____

CASMED 740 Monitor
Data Sheet

Dealer / Hospital:

_____

Monitor Type: _____

Address: _____ Monitor Serial Number: _____

City: _____

State: _____ Zip: _____

Battery Charge

Verify, the Battery Power Visual Indicator is lit.	Pass ( )	Fail ( )

Turning the CASMED 740 Monitor "ON"

Monitor displays Configuration for one second.	Pass ( )	Fail ( )
All equipment parameters are lit for one second.	Pass ( )	Fail ( )
All High Alarm values are displayed for one second, an audio tone is heard and the message "Hi Lims" is displayed in the Message Window.	Pass ( )	Fail ( )
All Low Alarm values are displayed for one second, an audio tone is heard and the message "Lo Lims" is displayed in the Message Window.	Pass ( )	Fail ( )
The monitor's current time is displayed for one second.	Pass ( )	Fail ( )

Displaying the Time

Verify, the monitor's Time is set correctly.	Pass ( )	Fail ( )

Alarm Audio

Verify, the Alarm Volume can be adjusted to one of five levels.	Pass ( )	Fail ( )

SpO_2 Audio

Verify, the SpO_2 Volume can be adjusted to one of five levels.	Pass ( )	Fail ( )

LED Check

Verify, all front panel LED displays and visual indicators are lit. Pass ( ) Fail ( )

+12 Volt Power Supply Check

Verify, the voltage reading to be 12 +/- 0.50. Pass ( ) Fail ( )

System Pressure

Deflate system pressure to 0 mmHg. Pass ( ) Fail ( )
Inflate system pressure to 50 mmHg. Pass ( ) Fail ( )
Inflate system pressure to 100 mmHg. Pass ( ) Fail ( )
Inflate system pressure to 150 mmHg. Pass ( ) Fail ( )
Inflate system pressure to 200 mmHg. Pass ( ) Fail ( )

Over Pressure

Verify, the Message Window displays “Over Pres”. Pass ( ) Fail ( )

Pneumatic Pressure Tests

Plug Tube Test Pass ( ) Fail ( )
500 mL Pressure Check Pass ( ) Fail ( )

NIBP Simulator Check

Monitor displays correct NIBP values. Pass ( ) Fail ( )

Temperature Calibration Check

Monitor displays correct Temperature value. Pass ( ) Fail ( )

Oximetry Simulator Check

Monitor displays correct SpO_2 values. Pass ( ) Fail ( )

Leakage

Verify, the monitor’s leakage to be *less* than 100 micro-amps. Pass ( ) Fail ( )

Hypot

Monitor, verify, no arching was observed. Pass ( ) Fail ( )

SpO_2, verify, no arching was observed. Pass ( ) Fail ( )

12. SERVICE PROCEDURES

INTRODUCTION

CAUTION:
Removal of the “Warranty Void If Removed” sticker voids any warranty the monitor may have. Refer service only to technicians trained by CAS Medical Systems Inc.

This section discusses the replacement of major assemblies found inside the CASMED 740 Monitor.

WARNING:
Before attempting to open or disassemble the CASMED 740 Monitor, disconnect the power cord from the monitor and remove the battery.

CAUTION:
Observe ESD (electrostatic discharge) precautions when working within the unit.

REQUIRED ITEMS

Tools

- Small, Phillips head screwdriver
- Medium, Phillips head screwdriver
- Flat blade, screwdriver
- Household scissors
- Torque screwdriver
- Adhesive, Loctite 425
- Adhesive, RTV, GE 162 (Electronic Grade)
- 91% Isopropyl Alcohol

Miscellaneous

- Label Set for CASMED 740 Monitor (CAS p/n 21-01-1317)
- Label Set for SureTemp® Plus Module (CAS p/n 21-01-1746)

REPLACING THE MONITOR BATTERY

A part number for the battery can be found on the label located on the inside panel of the battery pack. When the battery fails to hold a charge it will need to be replaced.

CAS Medical Systems recommends the battery be changed every two (2) years.

REMOVING THE BATTERY

1) Turn the monitor “OFF” and disconnect the power cord.
2) Push down on the battery latch to unlock the battery door from the rear panel of the monitor.
3) Carefully remove the battery pack from the rear panel of the monitor. Refer to Figure 14.

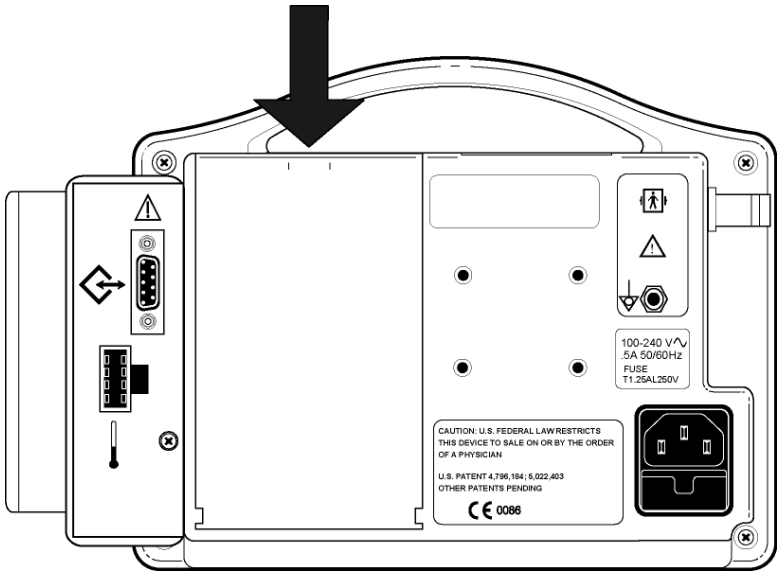

Figure 14: **Removing the Battery**

INSTALLING THE BATTERY

1) Align the Battery Pack guides with the bottom of the monitor.
2) Slowly close the battery door to ensure the connector in the monitor and the connector on the battery pack mate together.
3) Lock the battery door closed.

NOTE:
When the battery pack is re-installed, the monitor will automatically turn “ON”.

WARNING:
Do not disassemble the battery pack or batteries. The batteries contain electrolytes, which can cause injury to eyes, skin and clothing.

NOTE:
This product contains a rechargeable battery that is recyclable. Under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local authorities for instructions on recycling options in your area.

CHANGING THE FUSES

CASMED 740

The CASMED 740 Monitor uses a dual fuse power input receptacle. The receptacle incorporates fuses in the hot and neutral AC input lines that are user serviceable.

CAUTION:
For continued protection against fire hazard, replace only with identically rated fuses. Refer to Section 14, SPARE PARTS for part number information.

A fuse may need to be replaced if the monitor is plugged into an electrical outlet but the Battery Power Visual Indicator is not illuminated the color Green.

WARNING:
Before changing the fuse, unplug the monitor's power cord.

The fuse holder is incorporated into the power input receptacle and located under the power cord input connector.

To replace fuses:

1) Turn the monitor "OFF" and disconnect the power cord.
2) Press down on the locking tab, which holds the fuse holder in the power input receptacle.
3) While holding down on the tab, pull the fuse holder out.
4) Remove the fuses.
5) Place new fuses directly into the fuse holder.
6) Insert the fuse holder into the power input receptacle. There should be an audible "click" when it is secure.

CASMED 740M

The CASMED 740M Monitor uses a single fuse located inside the monitor on the DC-DC Converter Board.

The one (1) fuse for the CASMED 740M Monitor is rated at 125VAC, 3.15A, Time Lag. Refer to Section 14, SPARE PARTS for part number information.

CAUTION:
For continued protection against fire hazard, replace only with identically rated fuses.

A fuse may need to be replaced if the monitor is plugged into an electrical outlet but the Battery Power Visual Indicator is not illuminated the color Green.

WARNING:
Before changing the fuse, disconnect the monitor from its power source.

To replace the fuse:

1) Turn the monitor “OFF” and disconnect it from its power source.
2) Complete the steps in sections *Prior to Disassembly* and *Monitor Disassembly* (below).
3) Remove and replace the defective fuse from the DC-DC Converter Board. NOTE: The board will be attached to the monitor’s rear case assembly.
4) Secure the fuse in place by placing a bead of silicon RTV adhesive around the fuse.
5) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

MAIN MONITOR SERVICE PROCEDURES

PRIOR TO DISASSEMBLY

1) Turn the CASMED 740 Monitor “OFF” by pressing the front panel ON/STANDBY pushbutton.
2) Disconnect the monitor from the AC or DC power source.
3) Remove the battery from the monitor.

MONITOR DISASSEMBLY

1) Complete the steps in *Prior to Disassembly*.
2) Set the CASMED 740 Monitor face down onto a soft surface being careful not to scratch the front display.
3) If your monitor is equipped with either a Temperature Module or a RS232 Module, remove the one (1) screw that secures the module to the monitor's rear case. Remove the Module and place it to the side.
4) Remove the four (4) corner screws that secure the two case halves together.
5) Separate the monitor's front and rear cases, being careful not to stress the internal wire harnesses.
6) Disconnect the cable connectors from J1 and J2 on the Main Control Board.
7) Place the Rear panel assembly down next to the Front panel assembly.

MONITOR ASSEMBLY

1) Connect the Supply harness assembly to J1 on the Main Control Board.
2) Connect the Battery harness assembly to J2 on the Main Control Board.
3) Place the Rear Case assembly onto the Front Case assembly being careful of all wire harnesses and hoses.
4) Secure the two case halves together using the four (4) screws previously removed.
5) Re-install the module and secure it to the monitor's rear case using the Loctite adhesive and the one (1) screw previously removed. Apply a small amount of the adhesive to the threads of the screw and torque to 32 in.-oz.
6) Perform a complete System Check as described in the section *MAINTENANCE PROCEDURES*.

REPLACING THE POWER SUPPLY MODULE

The Power Supply Module is part of the Rear Case Assembly.

Removal

1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
2) Disconnect the two (2) harness assemblies from the Power Supply Module.
3) Remove the four (4) screws that secure the module to the rear case.
4) Remove the defective Power Supply Module.

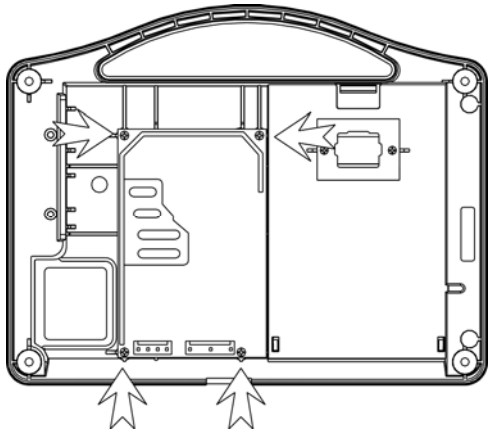

Figure 15: **Replacing the Power Supply Module**

Installation

1) Install the Power Supply module into the rear case so that the connectors on the Power Supply Module are at the bottom of the monitor's rear case.
2) Secure the Power Supply module using the hardware previously removed.
3) Re-connect the wire harness from the AC input receptacle.
4) Re-connect the wire harness that will be connected to the J1 connector on the Main Control Board.
5) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE NIBP MODULE

The NIBP Module is part of the Front Case Assembly.

Removal

1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
2) Disconnect the NIBP hose from the NIBP connector located on the side panel. Note the location of the hose from the connector to the board.
3) Remove the three (3) screws that secure the NIBP Module.
4) Separate the NIBP Module from the J4 connector located on the Main Control board.

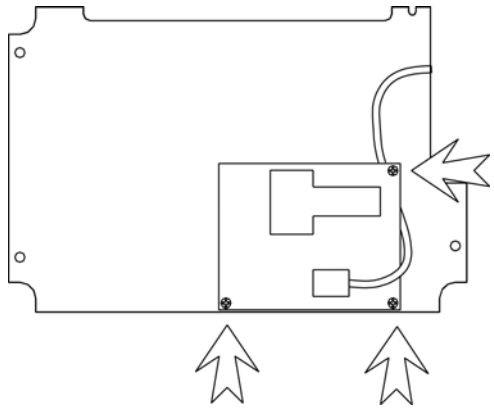

Figure 16: **Replacing the NIBP Module**

Installation

1) Align the female connector on the NIBP Module with the J4 connector on the Main Control board. Gently push the NIBP Module onto the connector pins.
2) Secure the board to the standoffs using the Loctite adhesive and the hardware previously removed. Apply a small amount of the adhesive to the threads of the screws and torque to 30 in.-oz.
3) Re-route the hose under the board and connect it to the NIBP connector on the side panel.
4) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE SpO_2 MODULE

The SpO_2 Module is part of the Front Case Assembly.

Removal

1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
2) Disconnect the cable assembly from the SpO_2 board to the Main Control board.
3) Disconnect the cable assembly from the side panel input connector to the SpO_2 board.
4) Remove the three (3) screws used to secure the SpO_2 board to the Main Control board standoffs. Remove the board.
5) Nonin SpO_2 – Remove the Nonin SpO_2 board from the Interface board by gently lifting the PCB from the four (4) nylon standoff support posts while pinching together the prong tips. Separate the SpO_2 board from the J2 connector located on the Interface board.

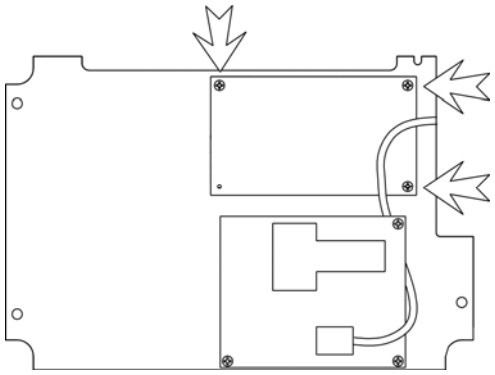

Figure 17: **Replacing the SpO_2 Module**

Installation

1) Nonin SpO_2 – Align the J2 connector with its mating connector on the SpO_2 module and gently push the SpO_2 board down. Secure the board in place by gently pushing down in the four corners.
2) Place the SpO_2 module onto the standoffs located on the Main Control board. Secure the board to the standoffs using the Loctite adhesive and the hardware previously removed. Apply a small amount of the adhesive to the threads of the screws and torque to 30 in.-oz.
3) Connect the harness assembly from the side panel input connector.
4) Connect the harness assembly from the Main Control board.
5) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE TEMPERATURE MODULE

SureTemp Temperature

The Temperature Module is part of the Front Case Assembly.

Removal

1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
2) Remove the Temperature Module by gently lifting the PCB from the four (4) nylon standoff support posts while pinching together the prong tips.
3) Separate the Temperature Module from the J8 and J9 connectors located on the Main Control board.

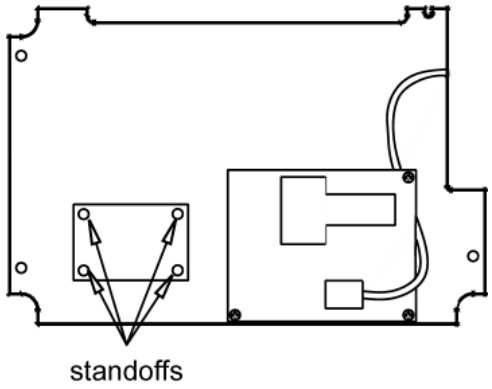

Figure 18: **Replacing the Temperature Module**

Installation

1) Align the 12 pin male connector (J9) and 13 pin male connector (J8) with their mating connectors on the Temperature board and gently push the Temperature board down.
2) Secure the board in place by gently pushing down in the four (4) corners.
3) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE MAIN CONTROL BOARD

The Main Control board is part of the Front Case Assembly.

Removal

1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
2) Complete the steps in *Replacing the NIBP module* to remove the NIBP module.
3) Complete the steps in *Replacing the SpO_2 Module* to remove the SpO_2 module.
4) Complete the steps in *Replacing the Temperature Module* to remove the Temperature module.
5) Remove the four (4) screws that secure the Main Control board to the Front Case.
6) Fold the Main Control board out from the Front Case and remove the ribbon cable from the J6 Front Panel Keyswitch connector. Remove the board.
7) Remove the Display Shield from over the LED displays on the Control Board.

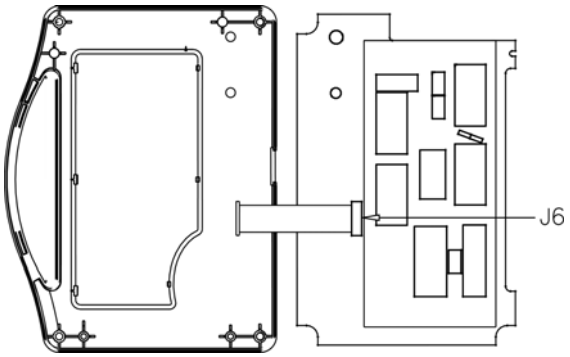

Figure 19: **Replacing the Main Control Board**

Installation

1) Place the Display Shield over the LED displays.
2) Adhere the appropriate labels to the LED displays (ADULT, NEO, TEMP).
3) Install the ribbon cable, from the front panel Keyswitch, into the J6 connector.
4) Fold the Main Control Board assembly over onto the Front Case.

NOTE:
Ensure the Display Window is free of dust and scratches before assembly.

NOTE:
Be careful not to crimp the ribbon cable between the PC Board and the Front Case.

5) Secure the board to the standoffs with the hardware previously removed.

6) Re-install the NIBP Board and any remaining option boards previously removed.

7) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE FRONT PANEL KEYSWITCH

The Front Panel Keyswitch is part of the Front Case Assembly.

Removal

1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.

2) Complete the steps in *Replacing the Main Control Board* to remove the board from the monitor.

3) Using the flat blade screwdriver, loosen the keyswitch from the front panel by pushing on the keyswitch from the inside of the front panel in the location where the ribbon cable is located.

4) Pry the defective keyswitch loose from the front panel.

5) Clean the keyswitch recess surface area of all remaining adhesive with 91% Isopropyl Alcohol.

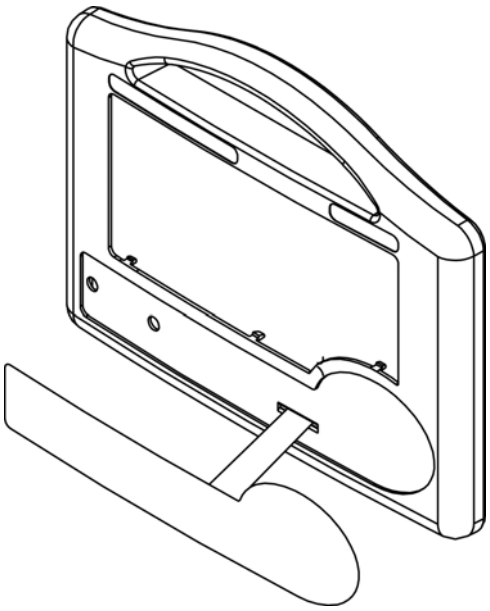

Figure 20: **Replacing the Front Panel Membrane Keyswitch**

Installation

1) Remove the liner from the rear of the keyswitch.

2) Feed the ribbon cable through the slot on the Front Panel and carefully position the keyswitch into the recess on the Front Case. Apply even pressure across the face of the keyswitch to secure it in place.

NOTE:
Use extreme caution when handling and positioning the membrane keyswitch. Do not bend, crease or pinch the keyswitch or the tail connector. Do not remove and reapply the keyswitch.

3) Plug the ribbon cable connector into the J6 connector on the Main Control Board.

4) Using a pair of household scissors cut back the shield tail flush to the front panel.

5) Finish assembling the monitor by following the steps in the Installation section of *Replacing The Main Board*.

MODULE SERVICE PROCEDURES

REPLACING THE RS232/NURSE CALL INTERFACE BOARD

Removal

1) Remove the one (1) screw that secures the Module to the monitor's rear case.

2) Remove the three (3) screws that secure the RS232/Nurse Call Interface Board to the Module case.

3) Remove the board and if necessary, disconnect the cable assembly from the Temperature Interface Board.

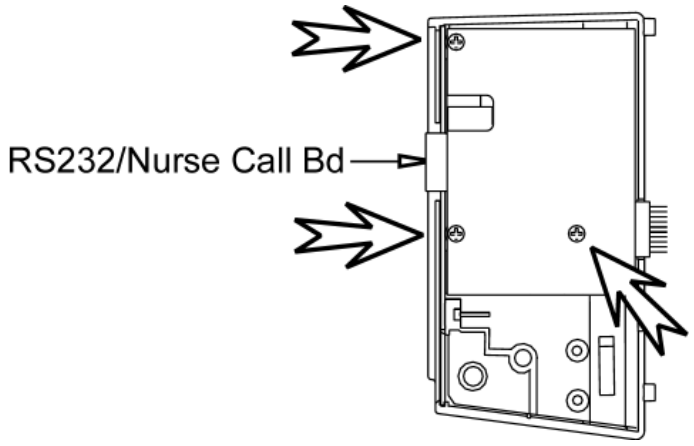

Figure 21: **Replacing the RS232/Nurse Call Interface Board**

Installation

1) If necessary, re-connect the cable assembly from the Temperature Interface Board to J2 on the RS232/Nurse Call Interface Board.

2) Install the RS232/Nurse Call Interface Board into the Module case and secure it with the three (3) screws previously removed.

3) Re-install the module and secure it to the monitor's rear case using the Loctite adhesive and the one (1) screw previously removed. Apply a small amount of the adhesive to the threads of the screw and torque to 32 in.-oz.

4) Perform a complete System Check as described in the section *MAINTENANCE PROCEDURES*.

REPLACING THE TEMPERATURE INTERFACE/SWITCH BOARD

Removal

1) Follow the steps as described in the Removal section of *Replacing the RS232/Nurse Call Interface Board*.

2) Remove the remaining one (1) screw that secures the Temperature Interface/Switch Board to the Module case.

3) Remove the board.

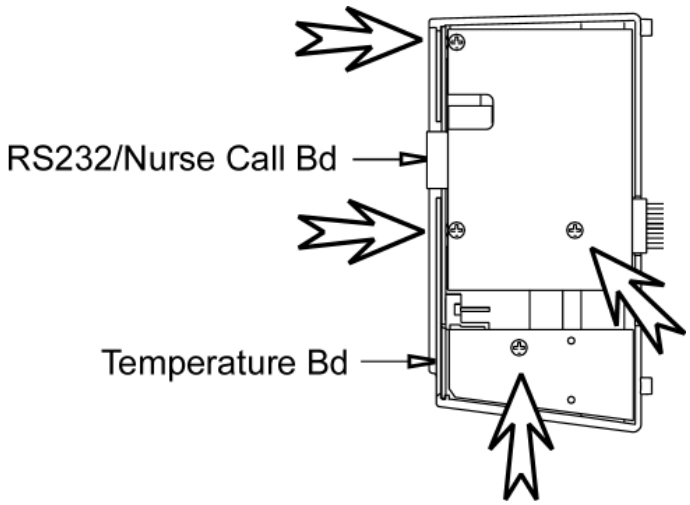

Figure 22: **Replacing the Temperature Interface/Switch Board**

Installation

1) Install the Temperature Interface/Switch Board into the Module case and secure it with the one (1) screw previously removed.
2) Finish assembling the Module by following the steps in the Installation section of *Replacing the RS232/Nurse Call Interface Board*.

SURETEMP® PLUS MODULE

REPLACING THE RS232/NURSE CALL INTERFACE BOARD

Removal

1) Remove the one (1) screw that secures the Module to the monitor's rear case.
2) Remove the label from the top of the module.
3) Remove the four (4) screw fastener covers.
4) Remove the four (4) screws that secure the Module's cases together.
5) Separate the Module's front and rear cases, being careful not to stress the internal ribbon cable.
6) Disconnect the ribbon cable from the RS232/Nurse Call Interface board.
7) Remove the four (4) screws that secure the board to the case.
8) Remove the board.

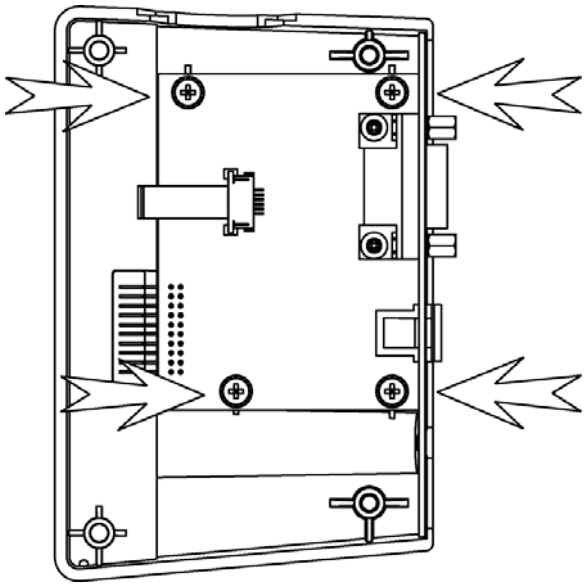

Figure 23: **Replacing the RS232/Nurse Call Interface Board**

Installation

1) Install the RS232/Nurse Call Interface Board into the Module case and secure it with the four (4) screws previously removed.
2) Reconnect the ribbon cable.
3) Place the two case halves together being careful not to pinch the ribbon cable.
4) Secure the two case halves together using the four (4) screws previously removed.
5) From the Label Set, re-install the screw fastener covers and the module's top label.

REPLACING THE SURETEMP® PLUS TEMPERATURE BOARD

Removal

1) Remove the one (1) screw that secures the Module to the monitor's rear case.
2) Remove the label from the top of the module.
3) Remove the four (4) screw fastener covers.
4) Remove the four (4) screws that secure the Module's cases together.
5) Separate the Module's front and rear cases, being careful not to stress the internal ribbon cable.
6) Disconnect the ribbon cable from the SureTemp Plus Temperature Board.
7) Remove the four (4) screws that secure the board to the case.
8) Remove the board.

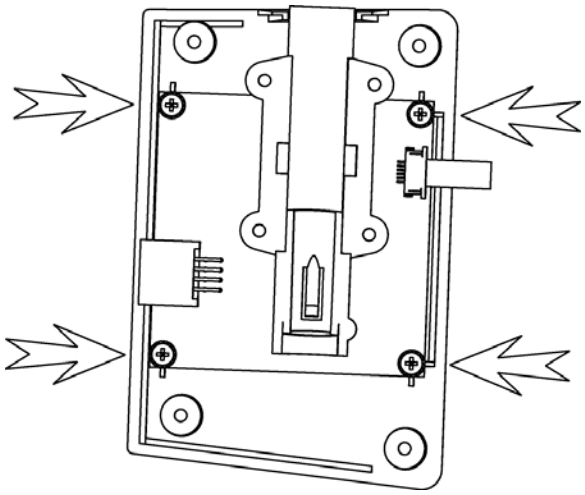

Figure 24: **Replacing the SureTemp Plus Temperature Board**

Installation

1) Install the SureTemp Plus Temperature Board into the Module case and secure it with the four (4) screws previously removed.
2) Reconnect the ribbon cable.
3) Place the two case halves together being careful not to pinch the ribbon cable.
4) Secure the two case halves together using the four (4) screws previously removed.
5) From the Label Set, re-install the screw fastener covers and the module's top label.

13. SCHEMATICS

NIBP BOARD

The NIBP Board used in the CASMED 740 Monitor is not user serviceable. No schematic diagram is provided.

MAIN CONTROL BOARD (SureTemp®)

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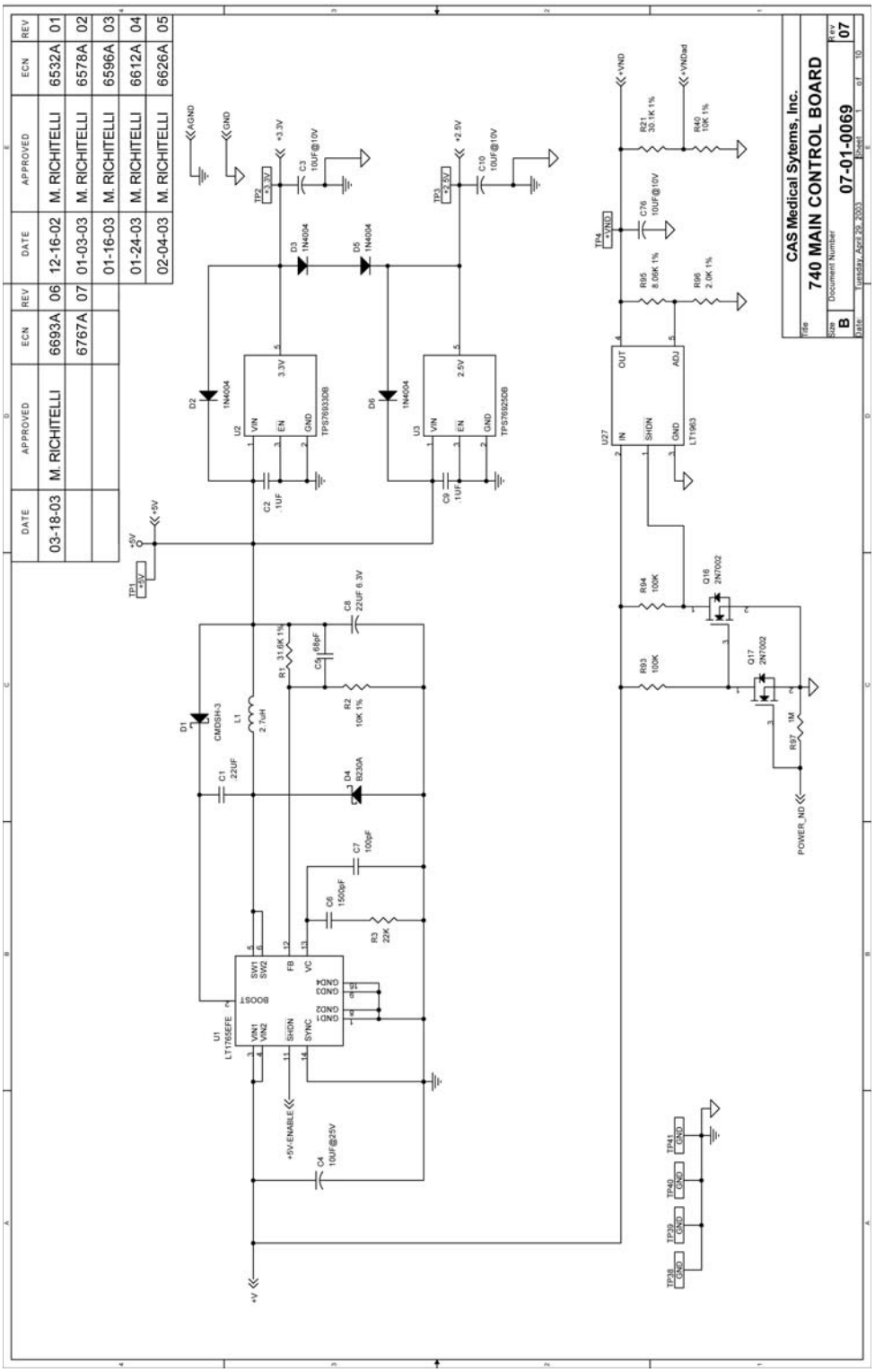

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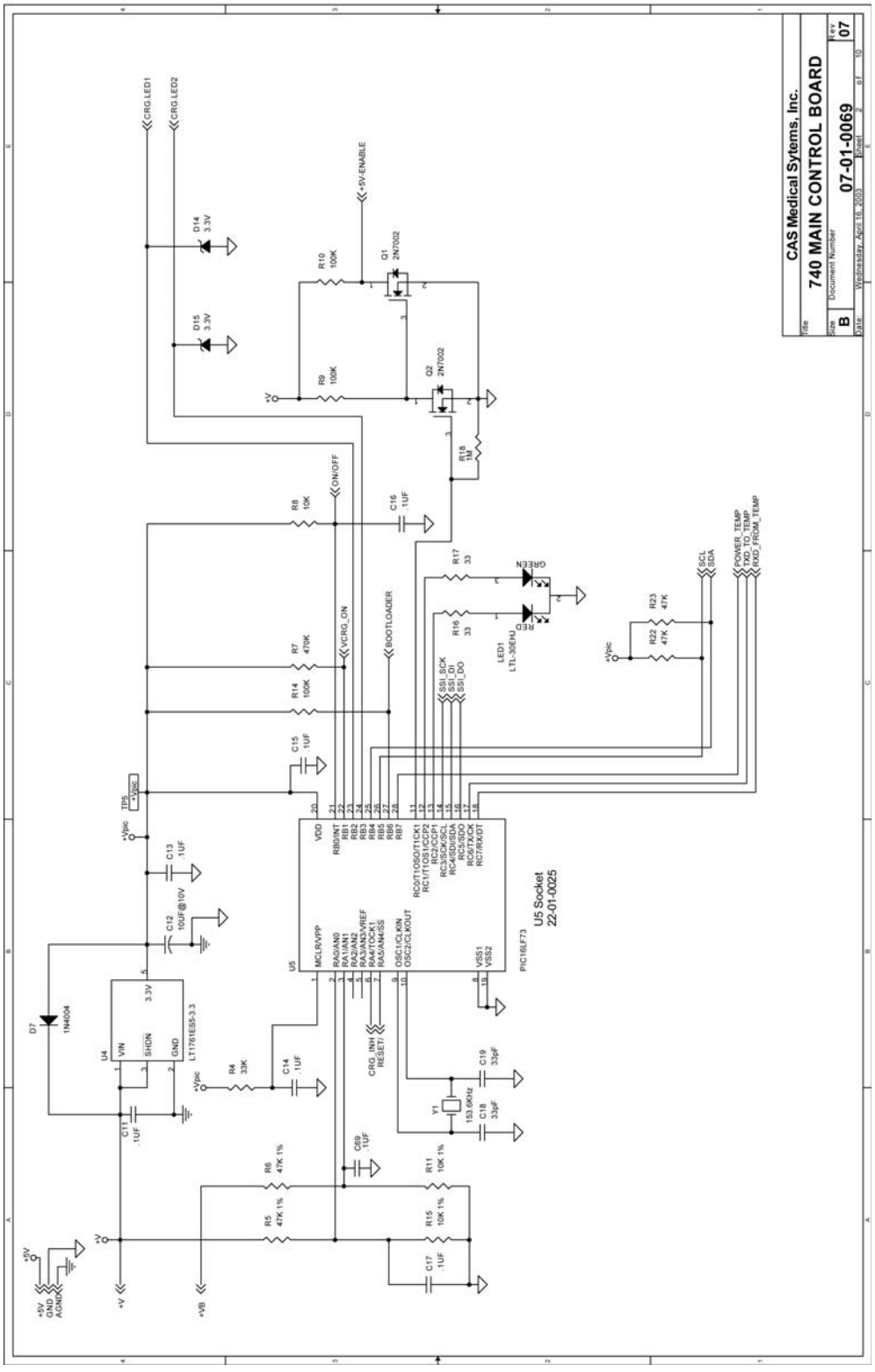
CAS Medical Sytems, Inc.
740 MAIN CONTROL BOARD
07-01-0069
Rev 07
Size B
Document Number
Date: Wednesday, April 16, 2003
Sheet 2 of 10
CRG.LED1
CRG.LED2
+5V-ENABLE
D14 3.3V
D15 3.3V
R10 100K
Q1 2N7002
R9 100K
Q2 2N7002
R18 1M
ON/OFF
R8 10K
C16 .1UF
R17 33
GREEN
RED
R16 33
LED1 LTL-306HJ
BOOTLOADER
R7 470K
VCRG_ON
R14 100K
C15 .1UF
SSI_SCK
SSI_DI
SSI_DO
R23 47K
R22 47K
SCL
SDA
POWER_TEMP
TXD_TO_TEMP
RXD_FROM_TEMP
TP5 +Vpic
+Vpic
C13 .1UF
C12 10UF@10V
U5
MCLR/VPP
VDD
VSS1
VSS2
PIC16LF73
U5 Socket
22-01-0025
D7 1N4004
U4
VIN
SHDN
3.3V
GND
LT1761ES5-3.3
C11 .1UF
R4 33K
C14 .1UF
CRG_INH
RESET/
C19 33pF
Y1 153.6KHz
C18 33pF
C69 .1UF
R6 47K 1%
R11 10K 1%
R5 47K 1%
R15 10K 1%
C17 .1UF
+5V
GND
AGNDX
+V
+VB

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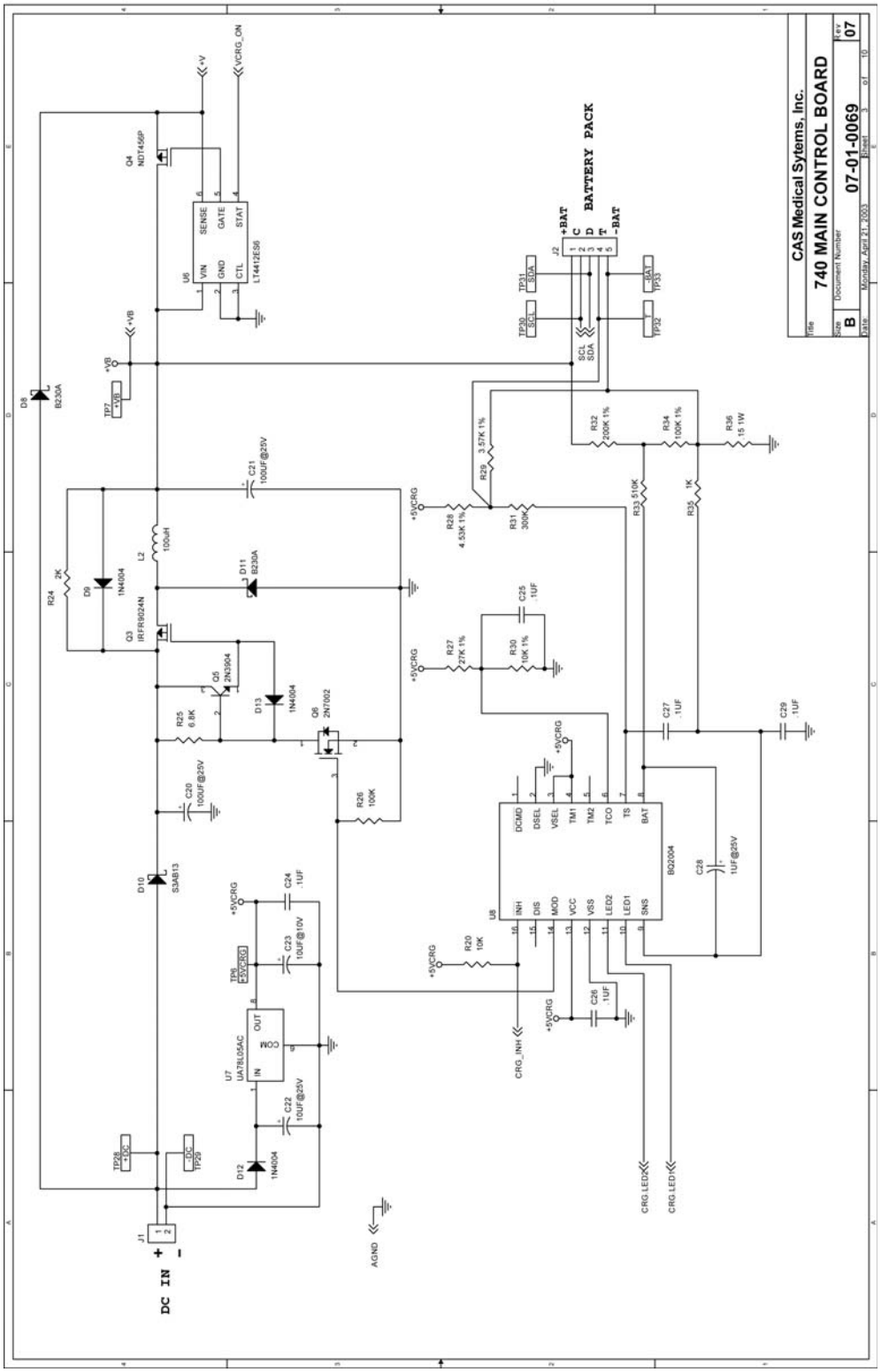
CAS Medical Sytems, Inc.
740 MAIN CONTROL BOARD
07-01-0069
07
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-BAT
DC IN
AGND
+VCRG_ON
+VCRG
+5VCRG
CRG_INH
CRG_LED1
CRG_LED2
SCL
SDA
U8
BQ2004
U7
LM78L05AC
U6
LT4412ES6
Q4
NDT456P
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IRFR9024N
Q5
2N3904
Q6
2N7002
L2
100uH
J1
J2

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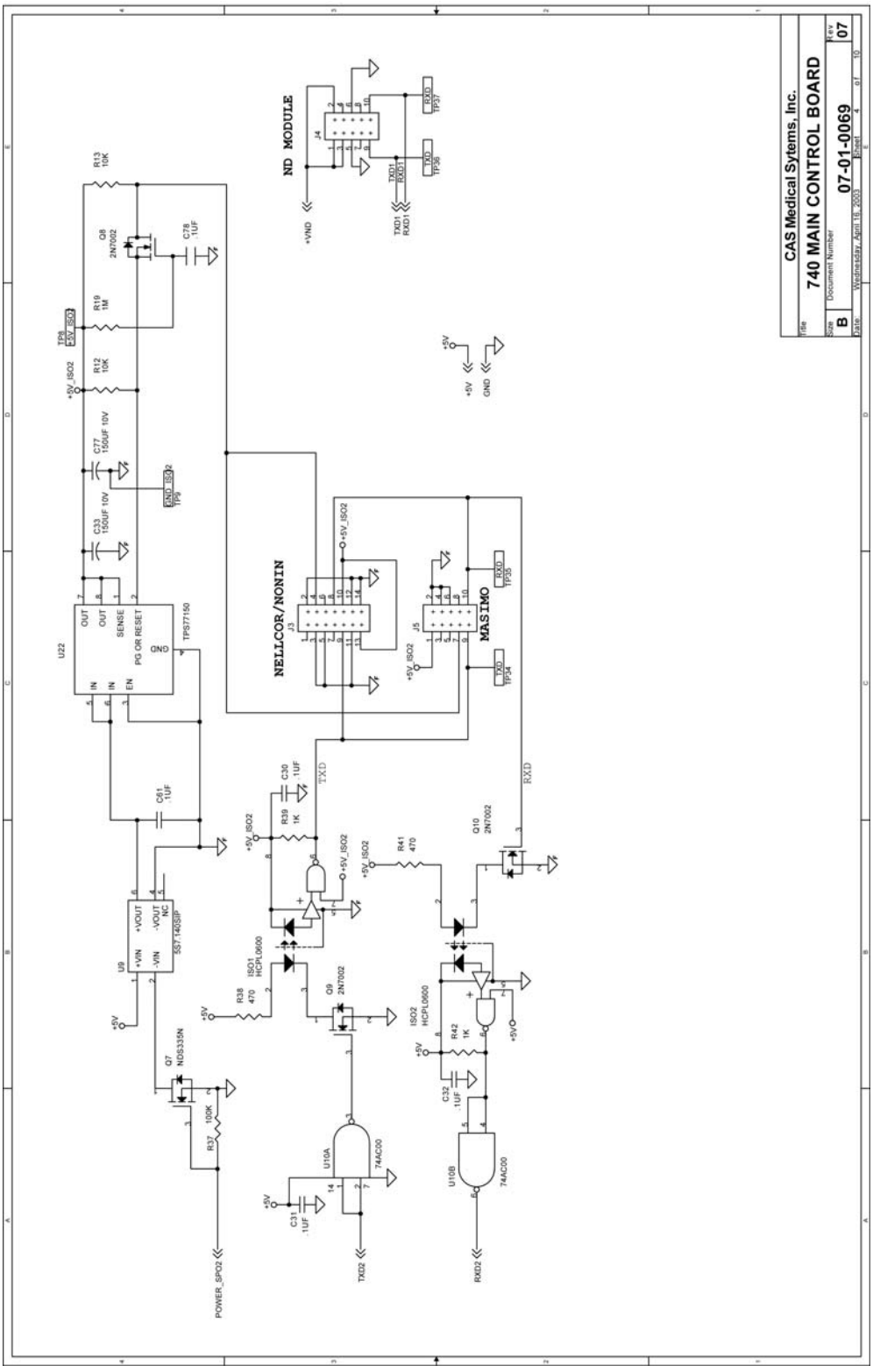
CAS Medical Sytems, Inc.
740 MAIN CONTROL BOARD
07-01-0069
07
ND MODULE
NELLCOR/NONIN
MASIMO
+VND
+5V
GND
+5V_ISO2
GND_ISO2
TXD1
RXD1
TXD
RXD
TXD2
RXD2
POWER_SPO2
U22
TPS77150
U9
SS7.140SIP
Q7
NDS335N
Q8
2N7002
Q9
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74AC00

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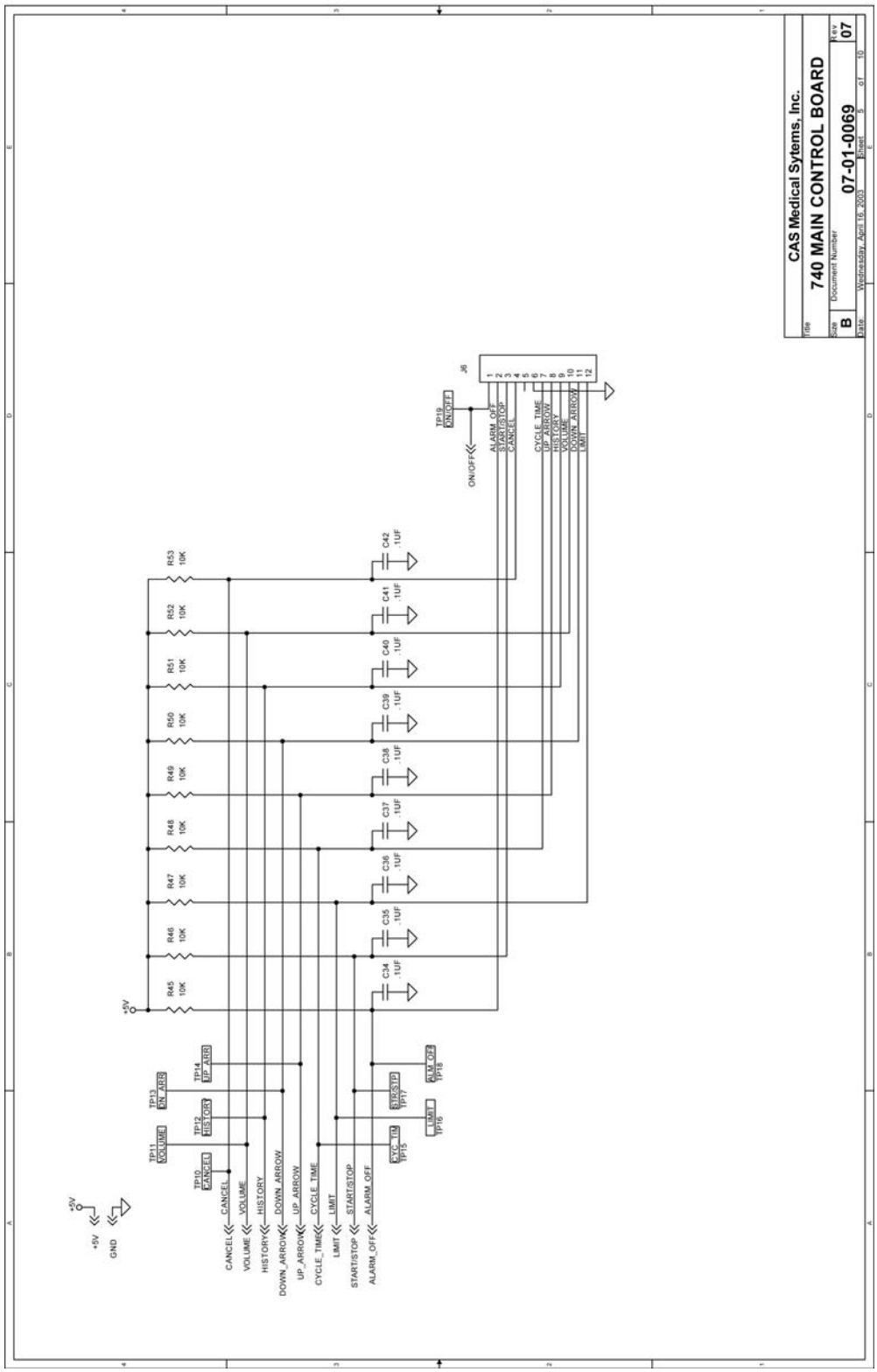
CAS Medical Sytems, Inc.
740 MAIN CONTROL BOARD
07-01-0069
Rev 07
Size B
Date: Wednesday, April 16, 2003
Sheet 5 of 10
J6
ALARM_OFF
START/STOP
CANCEL
CYCLE_TIME
LIMIT
HISTORY
VOLUME
DOWN_ARROW
UP_ARROW
ON/OFF
TP19 ON/OFF
R53 10K
R52 10K
R51 10K
R50 10K
R49 10K
R48 10K
R47 10K
R46 10K
R45 10K
C42 .1UF
C41 .1UF
C40 .1UF
C39 .1UF
C38 .1UF
C37 .1UF
C36 .1UF
C35 .1UF
C34 .1UF
+5V
TP14 UP_ARR
TP13 DN_ARR
TP12 HISTORY
TP11 VOLUME
TP10 CANCEL
ALM_OFF TP18
START/STP TP17
LIMIT TP16
CYC_TIM TP15
CANCEL
VOLUME
HISTORY
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UP_ARROW
CYCLE_TIME
LIMIT
START/STOP
ALARM_OFF
+5V
+5V
GND

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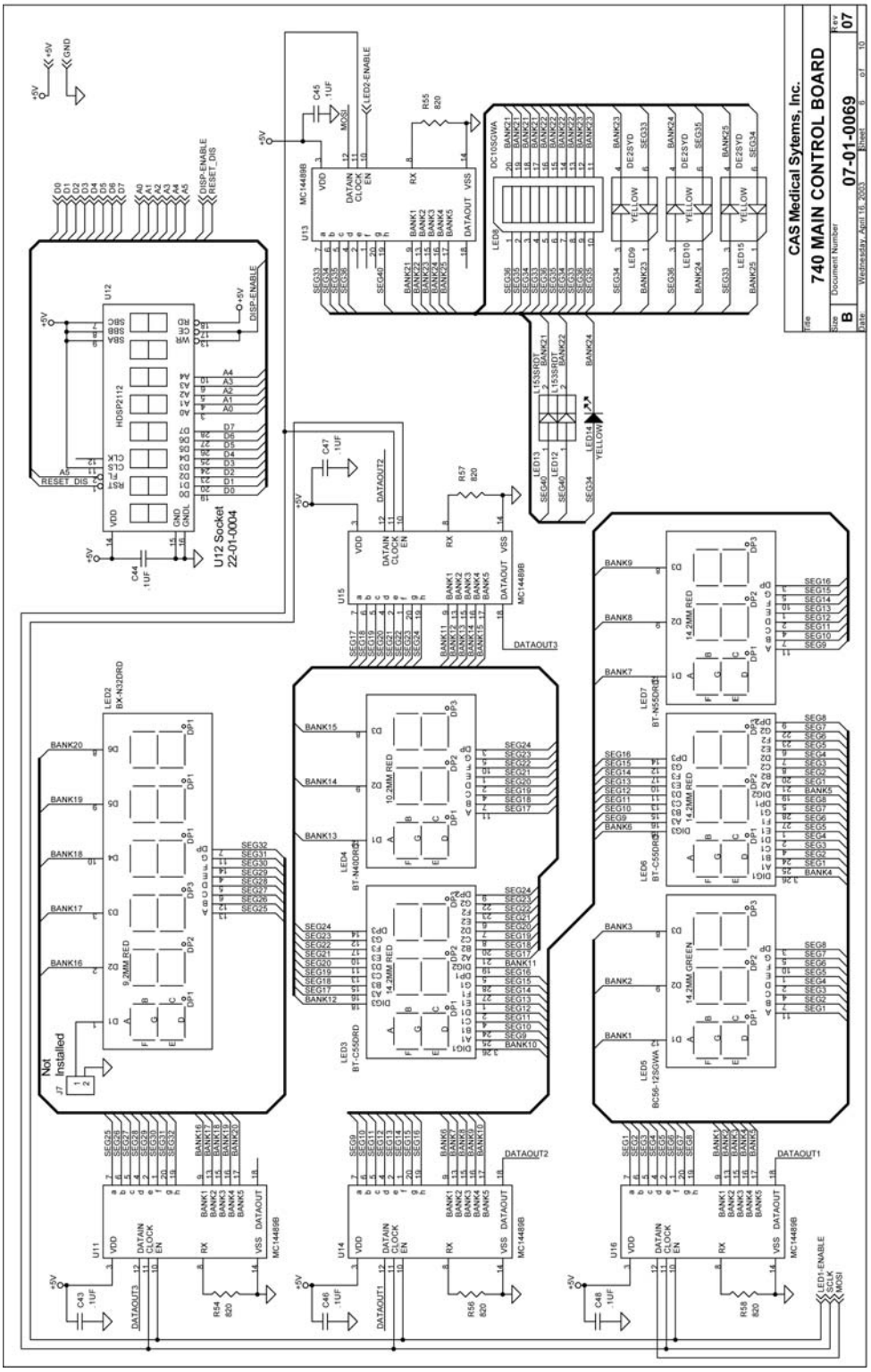
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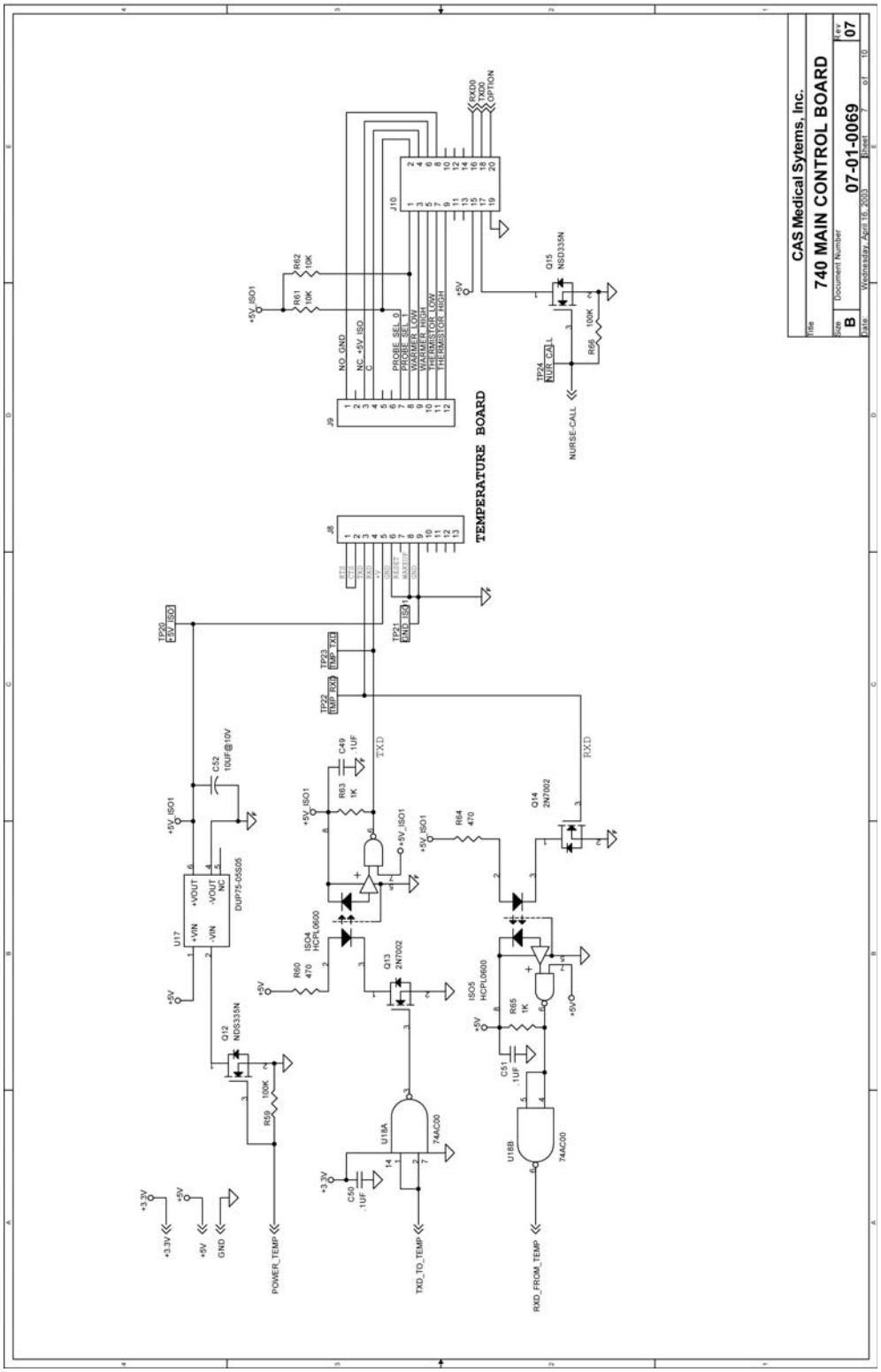
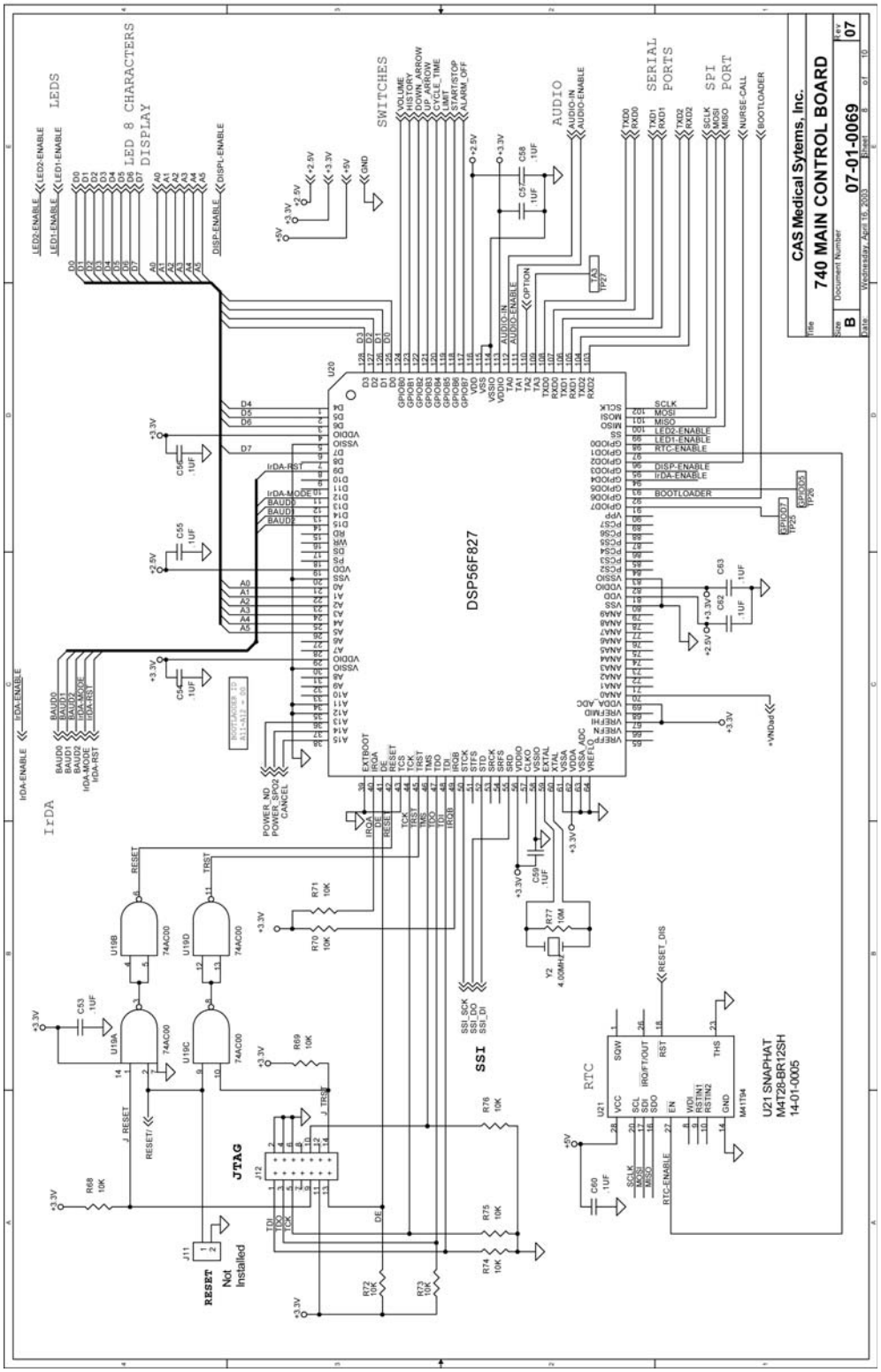
07-01-0069
Rev 07
Size B
Document Number
Date: Wednesday, April 16, 2003
Sheet 6 of 10
U12 Socket
22-01-0004
Not Installed
DISP-ENABLE
RESET_DIS
LED2-ENABLE
DATAOUT1
DATAOUT2
DATAOUT3
LED1 ENABLE
SCLK
MOSI

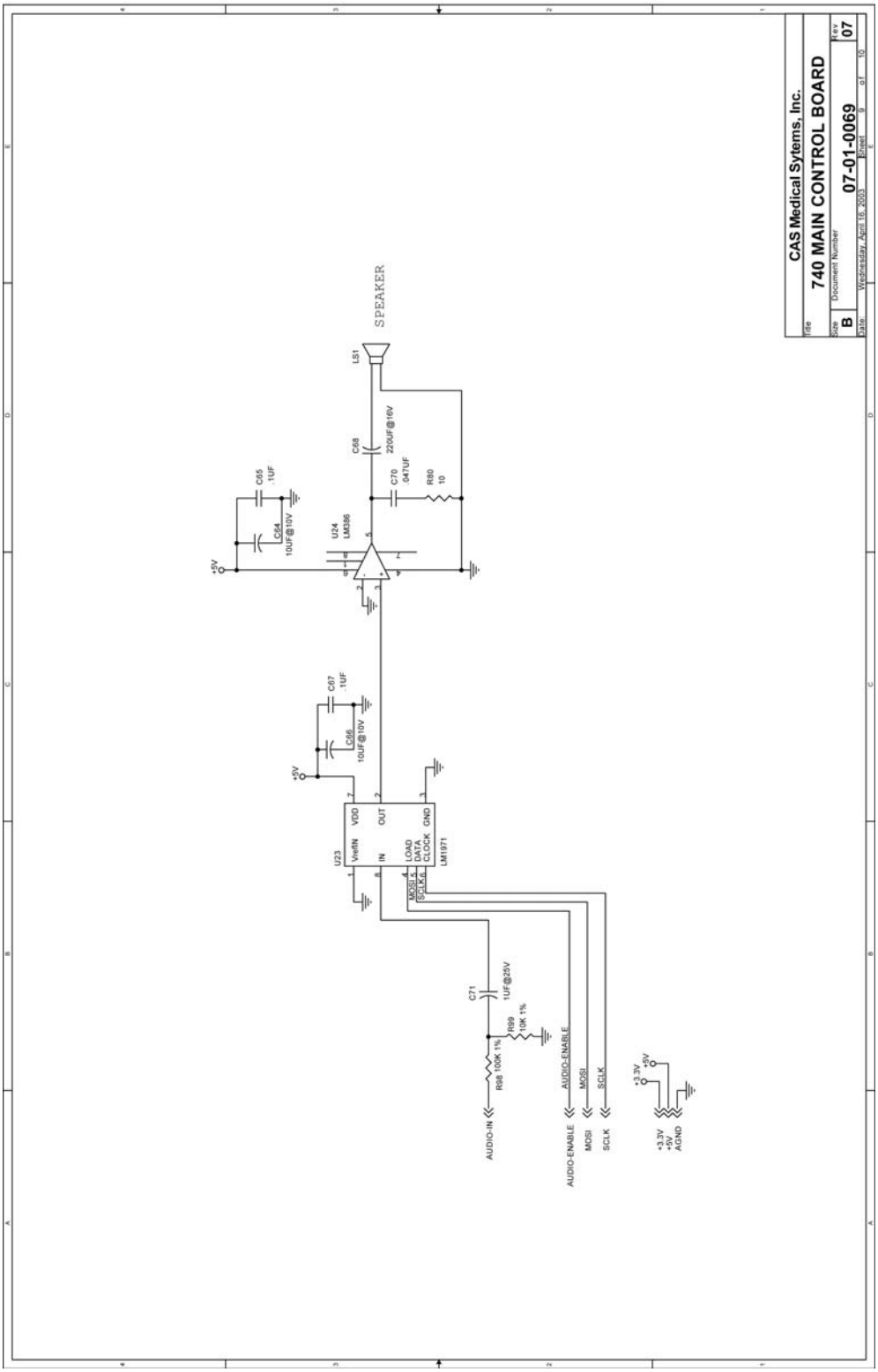
Page 7 of 12


CAS Medical Sytems, Inc.
740 MAIN CONTROL BOARD
07-01-0069
07
TEMPERATURE BOARD
NURSE-CALL
POWER_TEMP
TXD_TO_TEMP
RXD_FROM_TEMP
DUP75-05S05
ISO4 HCPL0600
ISO5 HCPL0600
74AC00

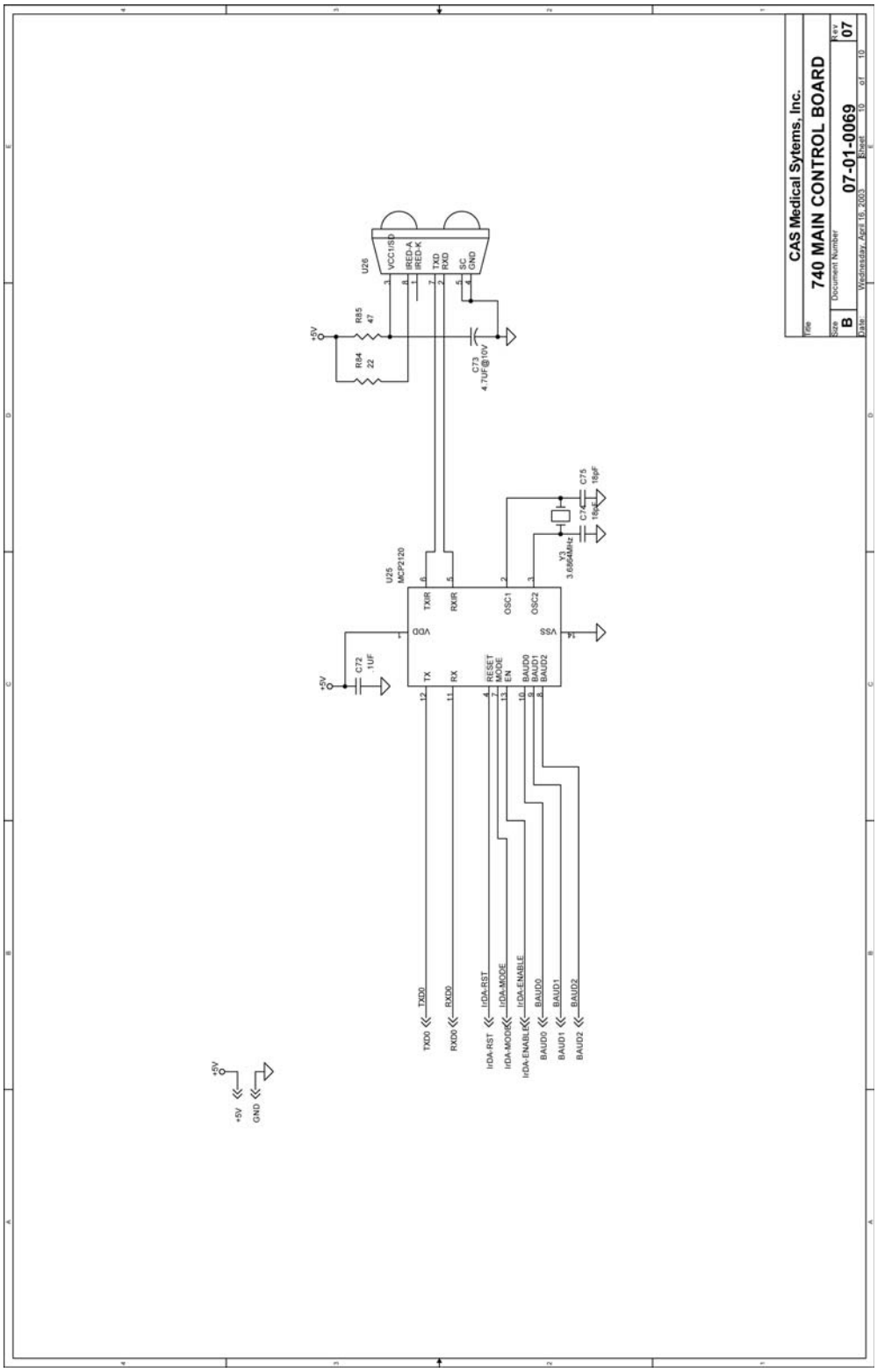
Page 8 of 12


CAS Medical Sytems, Inc.
740 MAIN CONTROL BOARD
07-01-0069
07
DSP56F827
LEDS
LED 8 CHARACTERS DISPLAY
SWITCHES
AUDIO
SERIAL PORTS
SPI PORT
IrDA
JTAG
SSI
RTC
U21 SNAPHAT M4T28-BR12SH 14-01-0005
RESET Not Installed

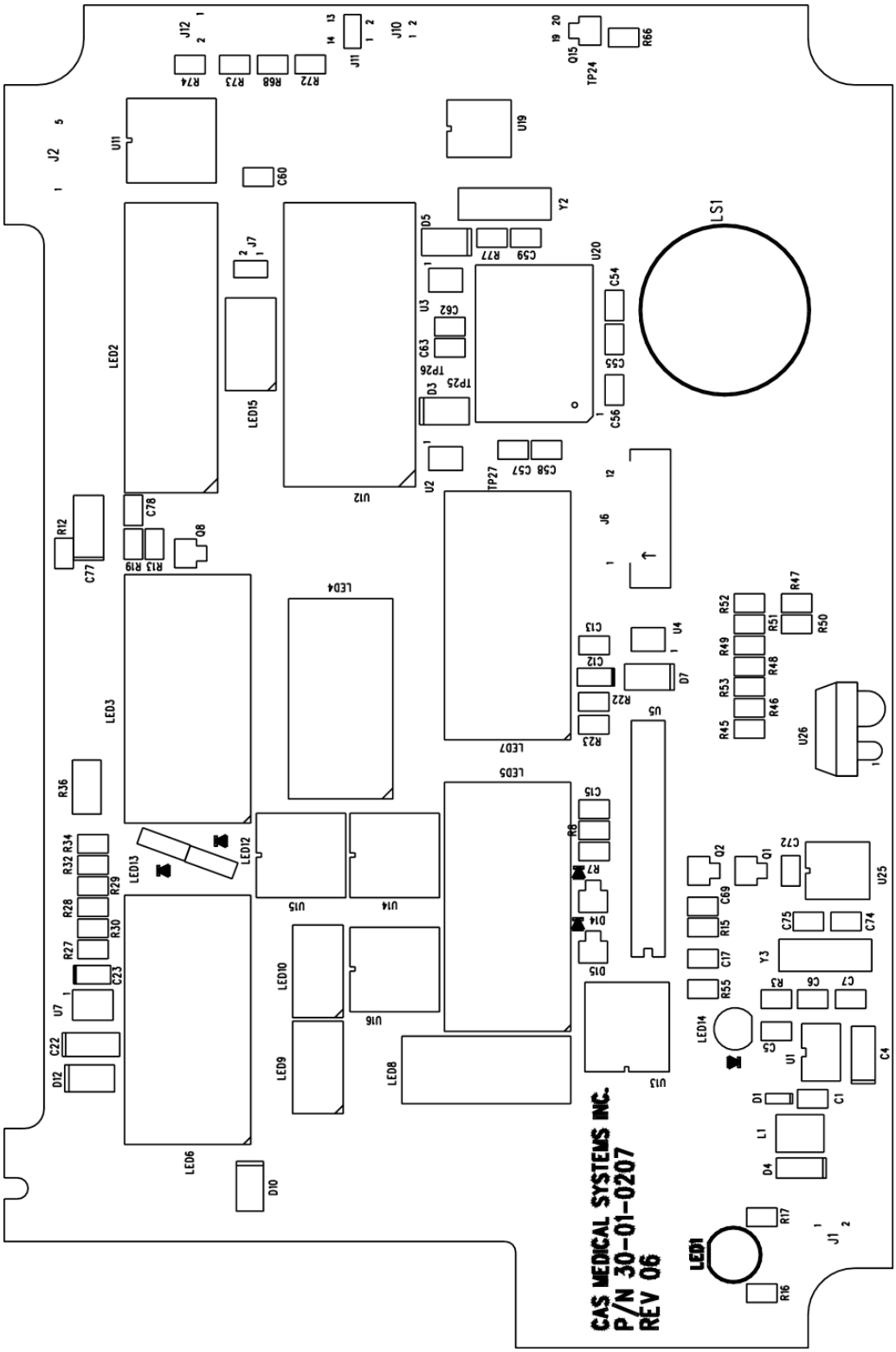
Page 9 of 12


CAS Medical Sytems, Inc.
740 MAIN CONTROL BOARD
07-01-0069
07
SPEAKER
LS1
C68
220UF@16V
C70
.047UF
R80
10
C65
.1UF
C64
10UF@10V
U24
LM386
+5V
C67
.1UF
C66
10UF@10V
U23
VrefIN
VDD
OUT
GND
IN
LOAD
DATA
CLOCK
LM1971
C71
1UF@25V
R99
10K 1%
R98 100K 1%
AUDIO-IN
AUDIO-ENABLE
MOSI
SCLK
+3.3V
+5V
AGND

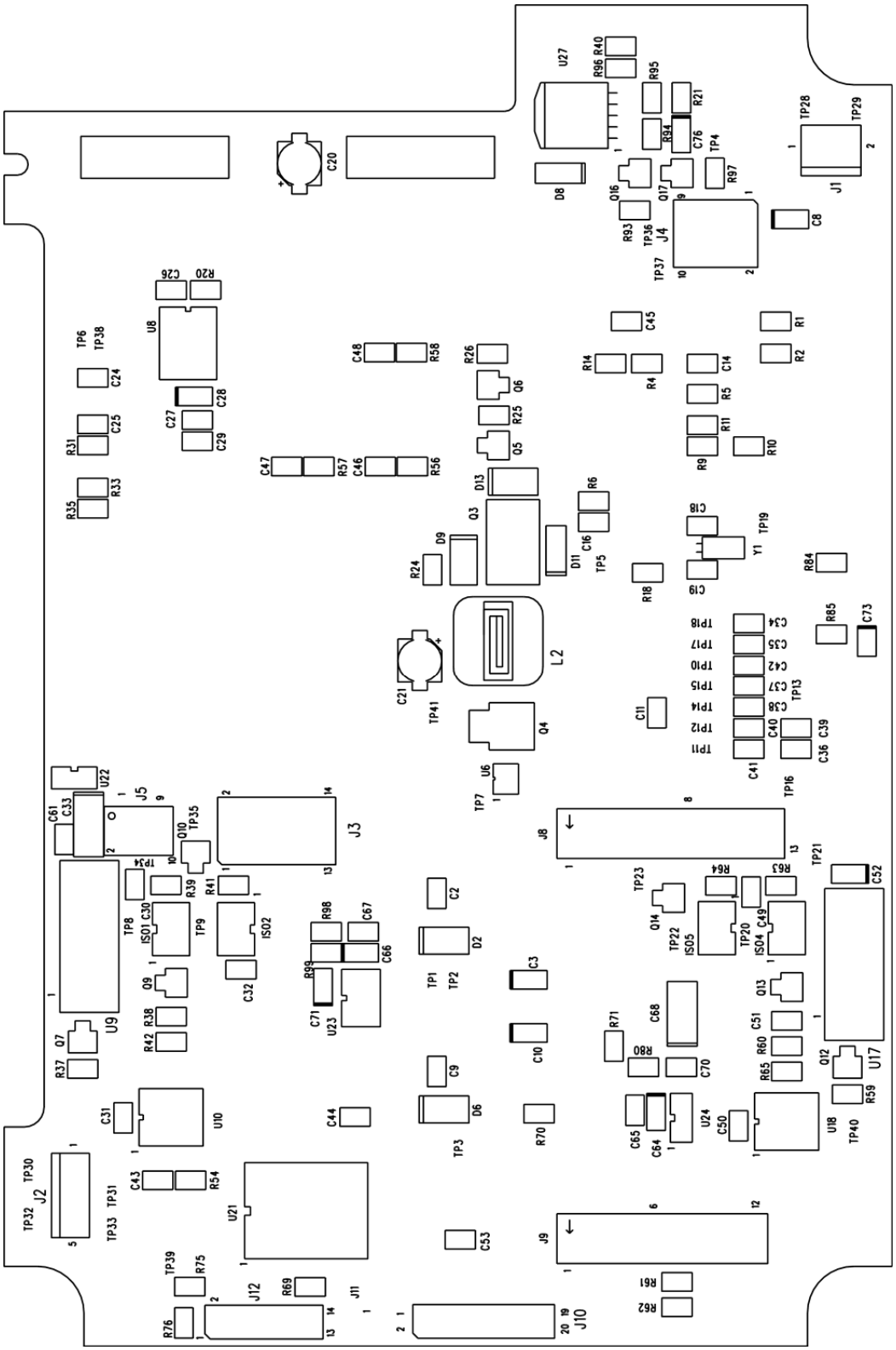
Page 10 of 12


CAS Medical Sytems, Inc.
740 MAIN CONTROL BOARD
07-01-0069
Rev 07
Size B
Document Number
Date: Wednesday, April 16, 2003
Sheet 10 of 10
U26
VCC1/SD
IRED-A
IRED-K
TXD
RXD
SC
GND
R85 47
R84 22
C73 4.7UF@10V
C75 18pF
C74 18pF
X3 3.6864MHz
U25 MCP2120
TXIR
RXIR
OSC1
OSC2
VDD
VSS
TX
RX
RESET
MODE
EN
BAUD0
BAUD1
BAUD2
C72 .1UF
+5V
GND
TXD0
RXD0
IrDA-RST
IrDA-MODE
IrDA-ENABLE
BAUD0
BAUD1
BAUD2

Page 11 of 12

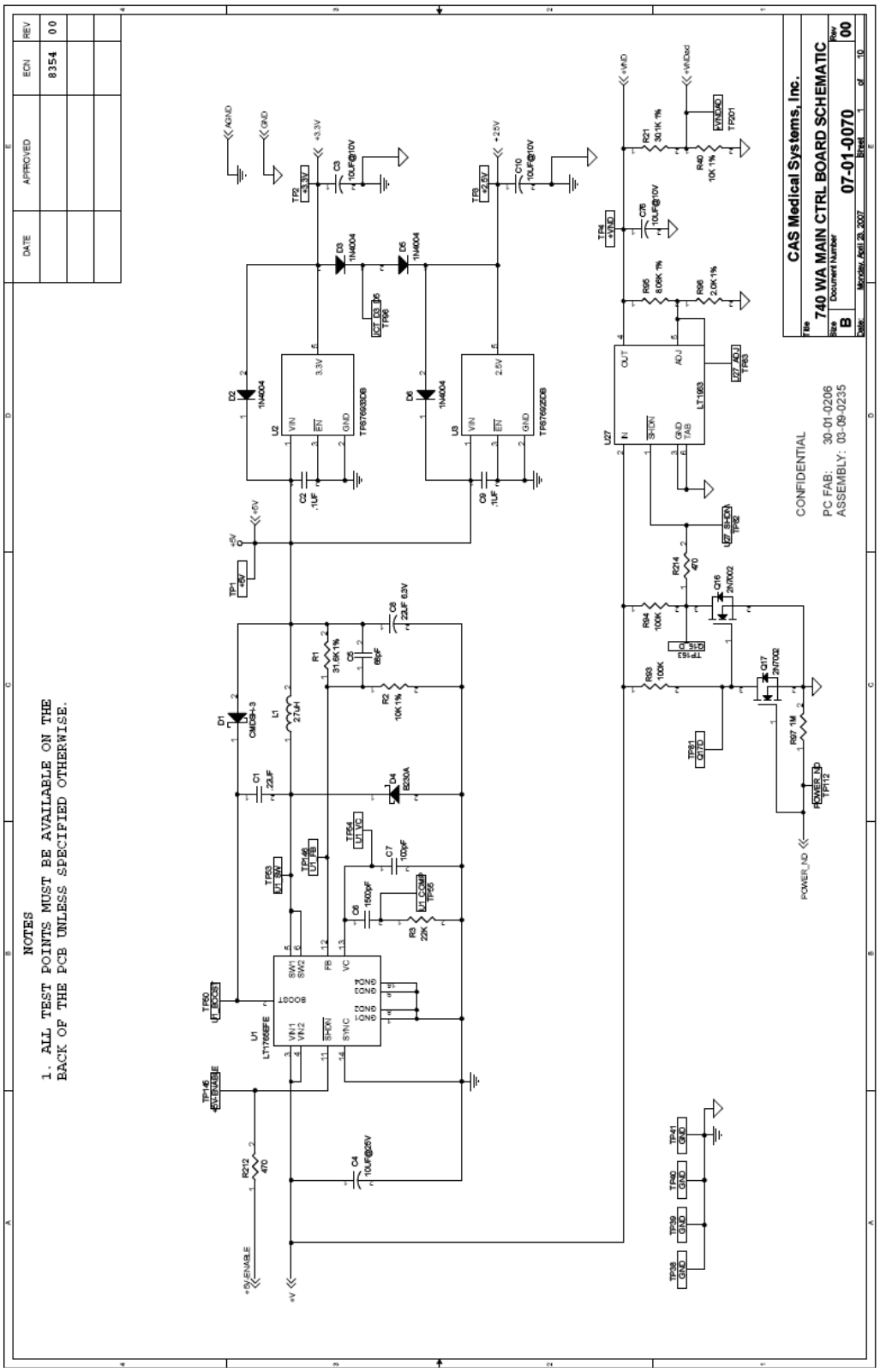


Page 12 of 12

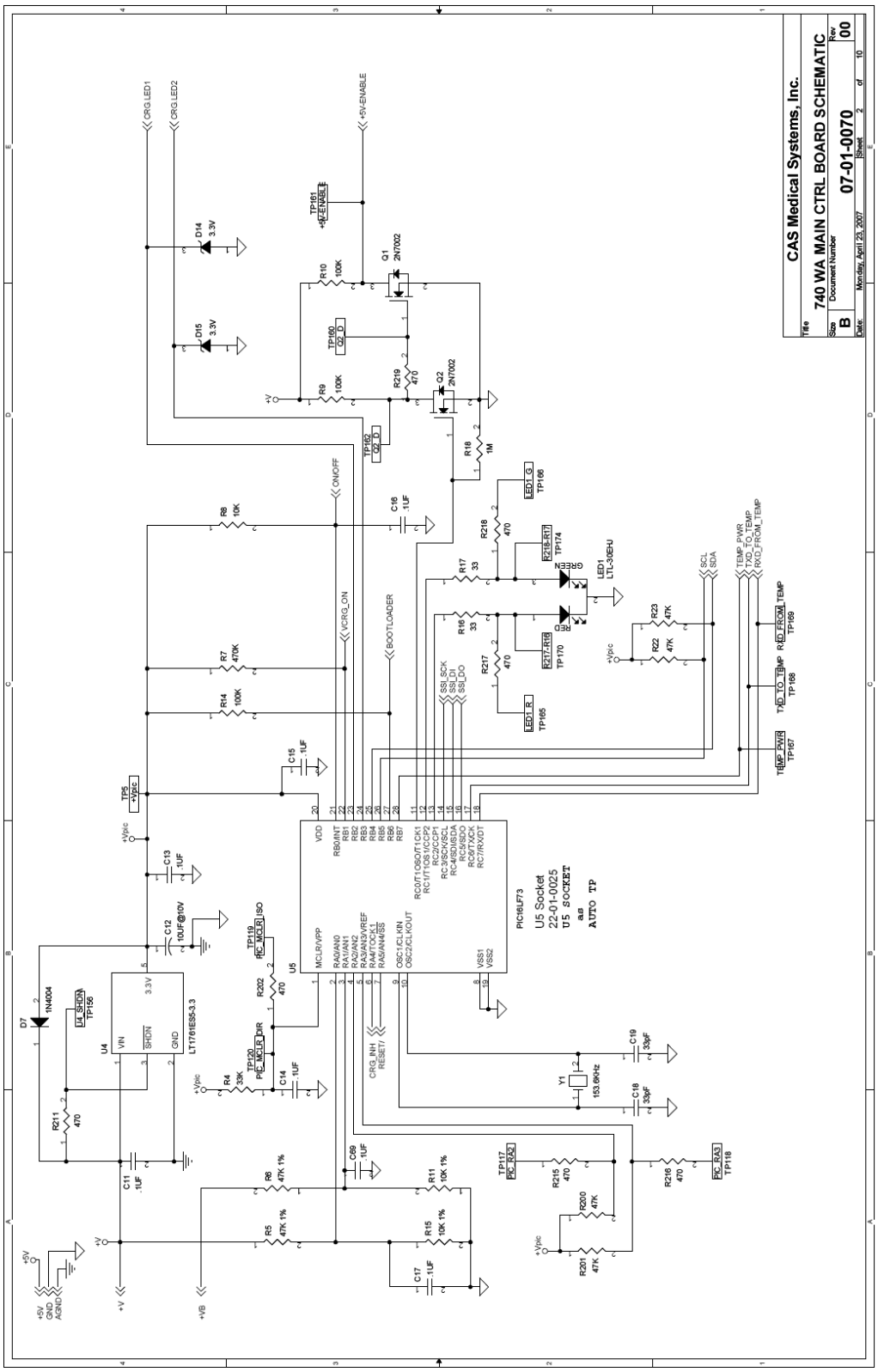


MAIN CONTROL BOARD (SureTemp® Plus)

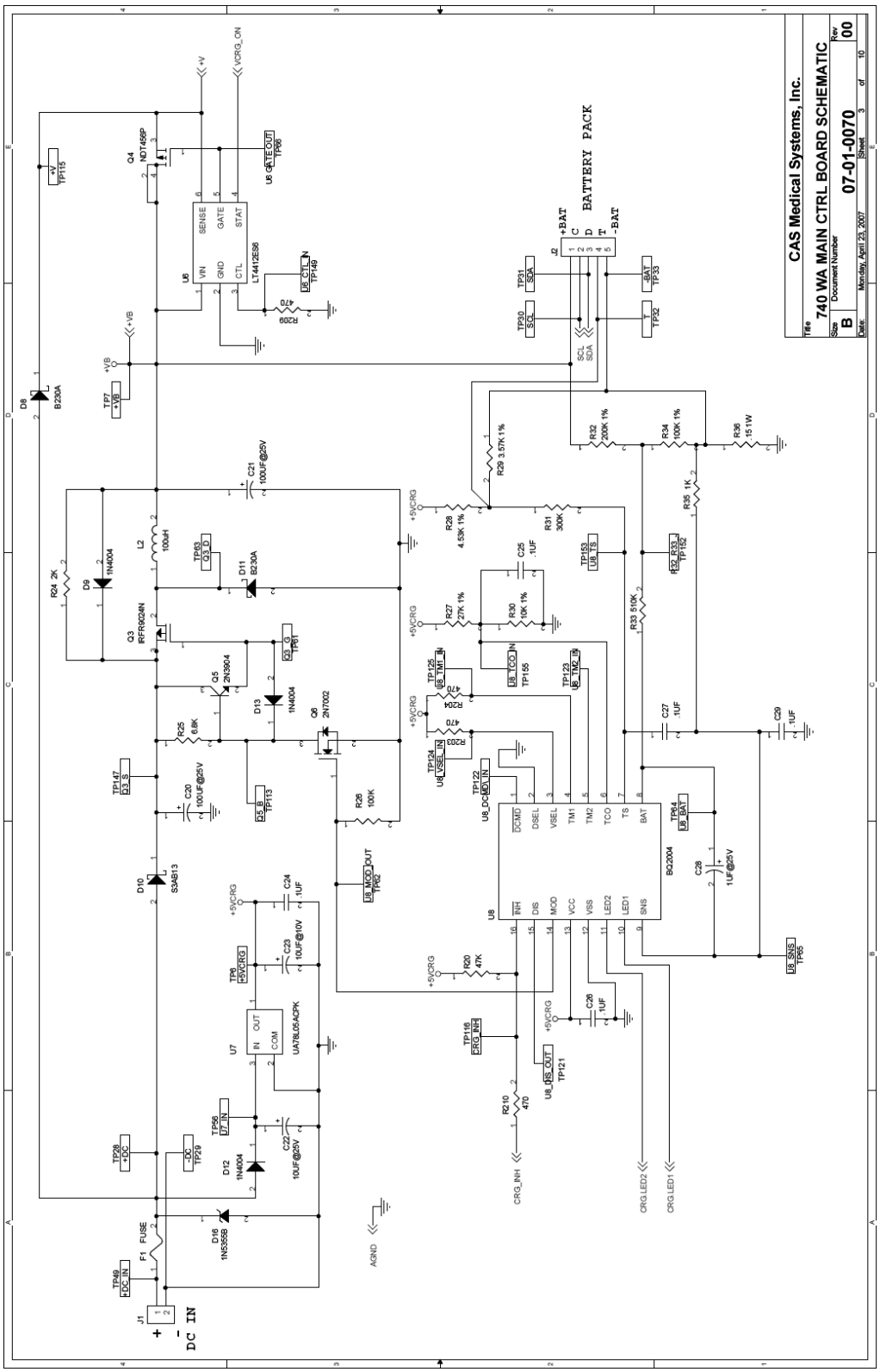
Page 1 of 12


CAS Medical Systems, Inc.
740 WA MAIN CTRL BOARD SCHEMATIC
07-01-0070
CONFIDENTIAL
PC FAB: 30-01-0206
ASSEMBLY: 03-09-0235
NOTES
1. ALL TEST POINTS MUST BE AVAILABLE ON THE BACK OF THE PCB UNLESS SPECIFIED OTHERWISE.

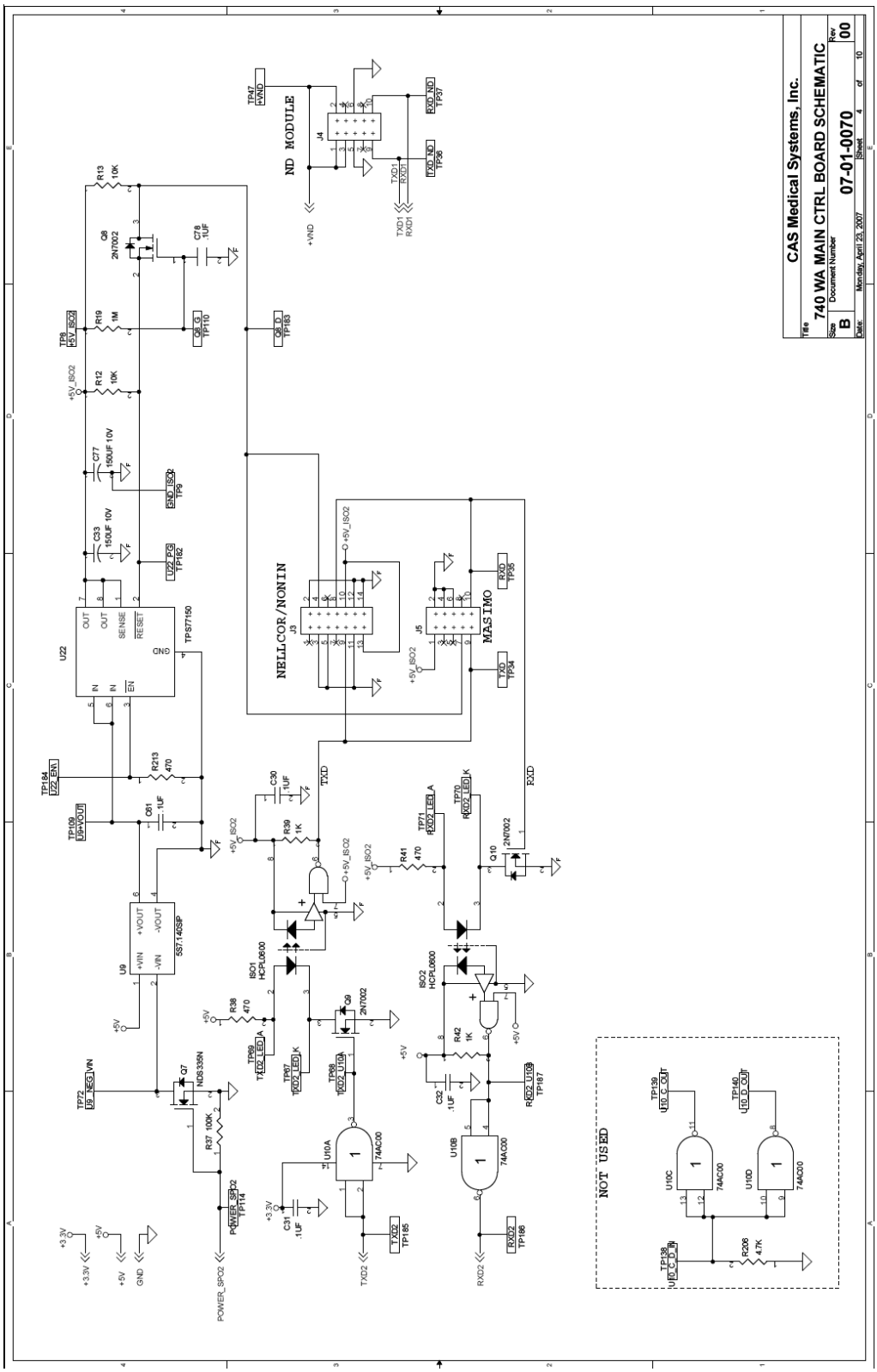
Page 2 of 12


CAS Medical Systems, Inc.
740 WA MAIN CTRL BOARD SCHEMATIC
07-01-0070
Rev 00
Size B
Document Number
Date: Monday, April 23, 2007
Sheet 2 of 10
Title
PIC16LF73
U5 Socket
22-01-0025
U5 SOCKET
alt
AUTO TP
LT1761ES5-3.3
LED1
LTL-30EHJ
GREEN
RED
CRG_LED1
CRG_LED2
+5V-ENABLE
ON/OFF
VCRG_ON
BOOTLOADER
SSI_SCK
SSI_DI
SSI_DO
SCL
SDA
TEMP_PWR
TXD_TO_TEMP
RXD_FROM_TEMP
PIC_MCLR
PIC_MCLR_DIR
PIC_RA2
PIC_RA3
CRG_INH
RESET
+Vpic
+5V
+V
+VB
AGND
GND

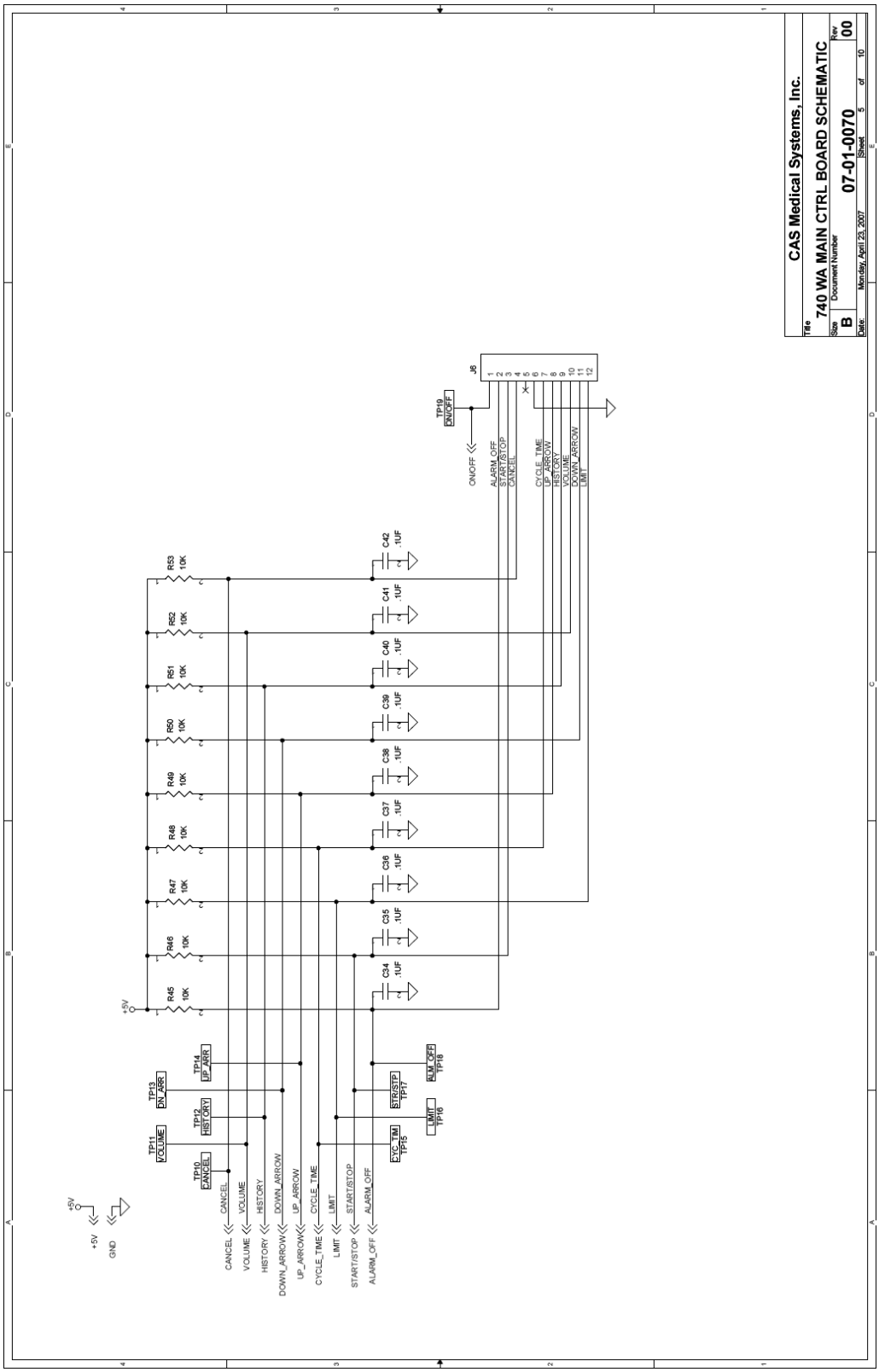
Page 3 of 12


CAS Medical Systems, Inc.
740 WA MAIN CTRL BOARD SCHEMATIC
07-01-0070
00
B
Monday, April 23, 2007
BATTERY PACK
+BAT
-BAT
DC IN
BQ2004
UA78L05ACPK
LT4412ES6
AGND
CRG_INH
CRG_LED2
CRG_LED1

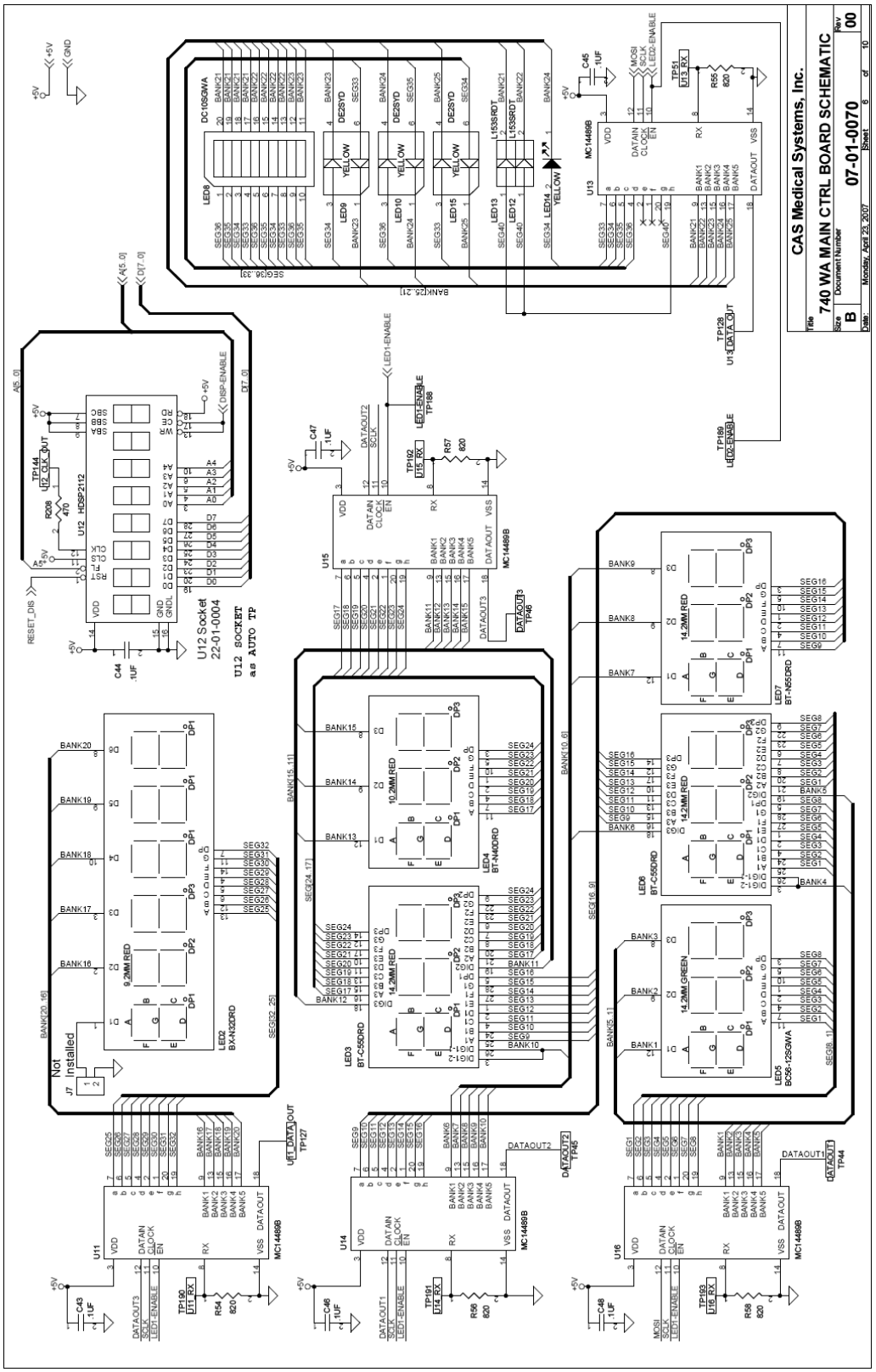
Page 4 of 12


CAS Medical Systems, Inc.
740 WA MAIN CTRL BOARD SCHEMATIC
07-01-0070
Rev 00
Size B
Document Number
Date: Monday, April 23, 2007
Sheet 4 of 10
ND MODULE
NELLCOR/NONIN
MASIMO
NOT USED
U22
TPS77150
U9
SS7.140SP
ISO1 HCPL0600
ISO2 HCPL0600
U10A
U10B
U10C
U10D
74AC00
Q7 NDS355N
Q8 2N7002
Q9 2N7002
Q10 2N7002
+5V_ISO2
+3.3V
+5V
GND
POWER_SPO2
TXD2
RXD2
TXD1
RXD1
TXD
RXD

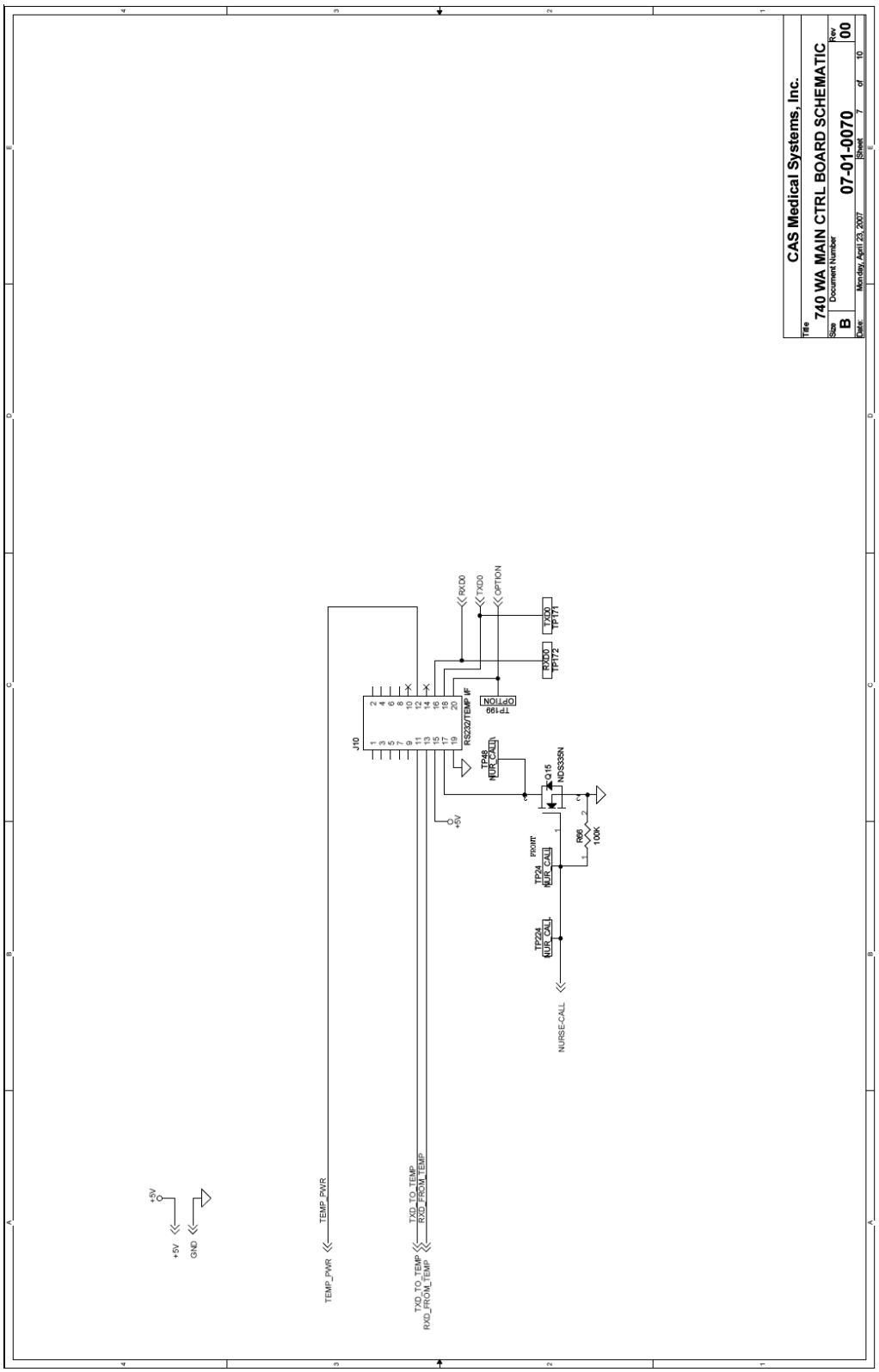
Page 5 of 12


CAS Medical Systems, Inc.
740 WA MAIN CTRL BOARD SCHEMATIC
Size B
Document Number 07-01-0070
Rev 00
Date Monday, April 23, 2007
Sheet 5 of 10
J6
TP19 ON/OFF
ON/OFF
ALARM_OFF
START/STOP
CANCEL
CYCLE_TIME
UP_ARROW
HISTORY
VOLUME
DOWN_ARROW
LIMIT
R53 10K
R52 10K
R51 10K
R50 10K
R49 10K
R48 10K
R47 10K
R46 10K
R45 10K
C42 .1UF
C41 .1UF
C40 .1UF
C39 .1UF
C38 .1UF
C37 .1UF
C36 .1UF
C35 .1UF
C34 .1UF
+5V
TP14 UP_ARR
TP13 DN_ARR
TP12 HISTORY
TP11 VOLUME
TP10 CANCEL
TP15 CYC_TIM
TP17 STR/STP
TP16 LIMIT
TP18 ALM_OFF
+5V
+5V
GND
CANCEL
VOLUME
HISTORY
DOWN_ARROW
UP_ARROW
CYCLE_TIME
LIMIT
START/STOP
ALARM_OFF

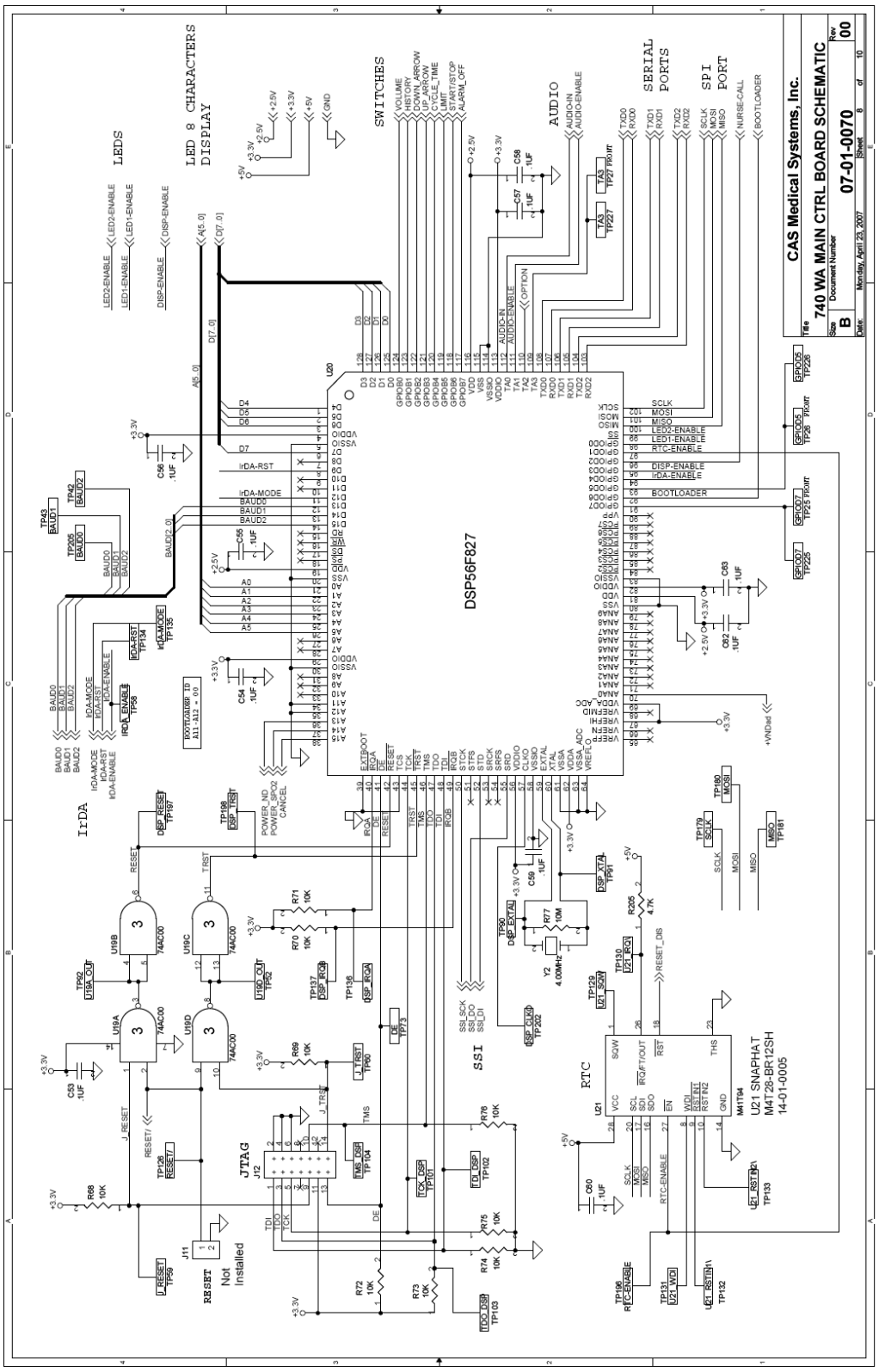
Page 6 of 12


CAS Medical Systems, Inc.
740 WA MAIN CTRL BOARD SCHEMATIC
07-01-0070
00
B
Monday, April 23, 2007
U12 Socket
22-01-0004
U12 SOCKET as AUTO TP
Not Installed
LED2 BX-N32DRD
LED3 BT-C550RD
LED4 BT-N40DRD
LED5 BC56-12SGWA
LED6 BT-C56DRD
LED7 BT-N56DRD
DC10SGWA
MC14489B
HDSP2112

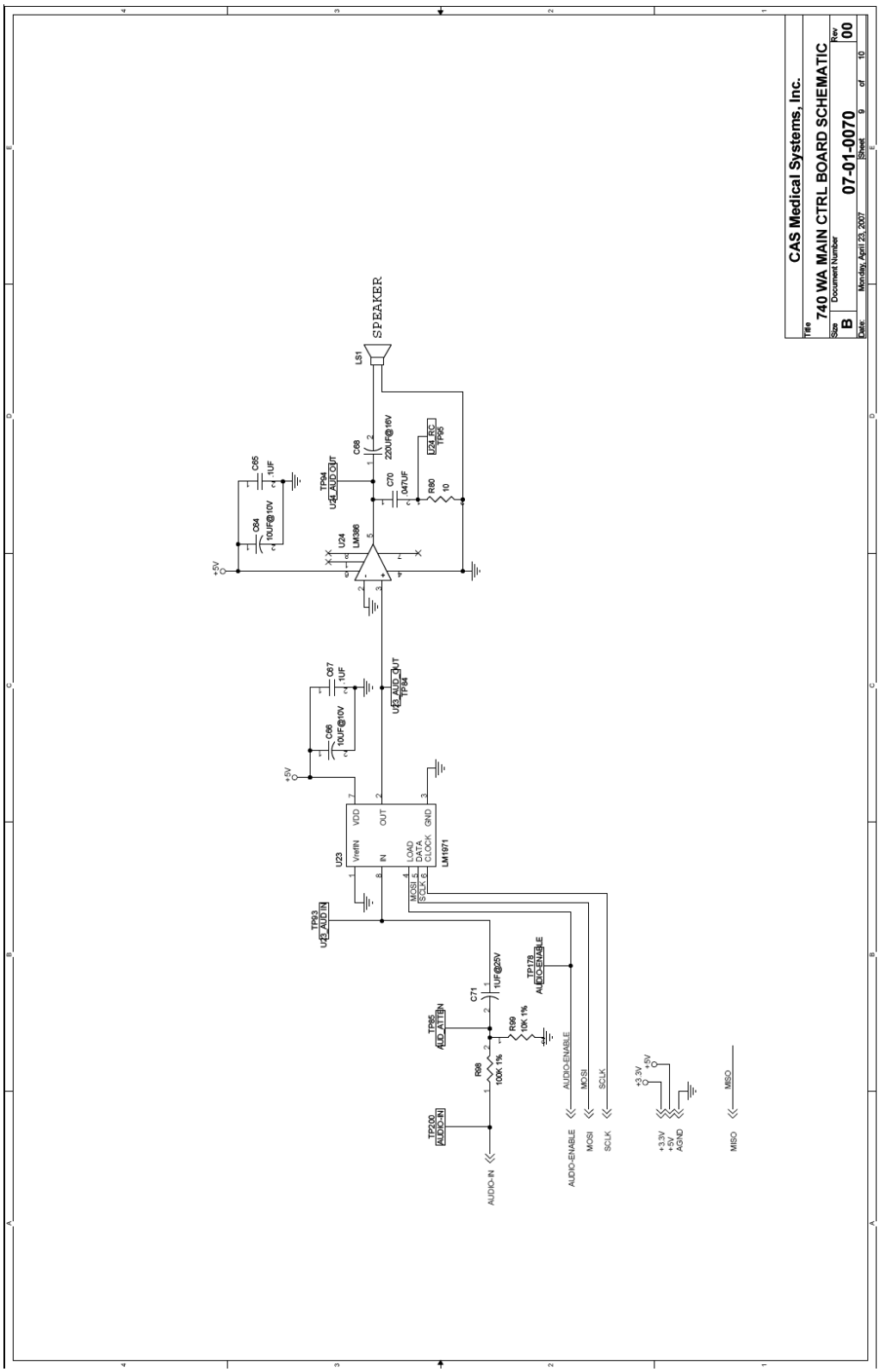
Page 7 of 12


CAS Medical Systems, Inc.
740 WA MAIN CTRL BOARD SCHEMATIC
07-01-0070
00
RXD0
TXD0
OPTION
J10
RS232/TEMP I/F
TP199
OPTION
TP172
TXD0
TP171
RXD0
TP246
NURSE_CALL
Q15
NDS335N
R90
100K
TP24
NUR_CALL
TP224
NUR_CALL
NURSE-CALL
+5V
GND
TEMP_PWR
TXD_TO_TEMP
RXD_FROM_TEMP

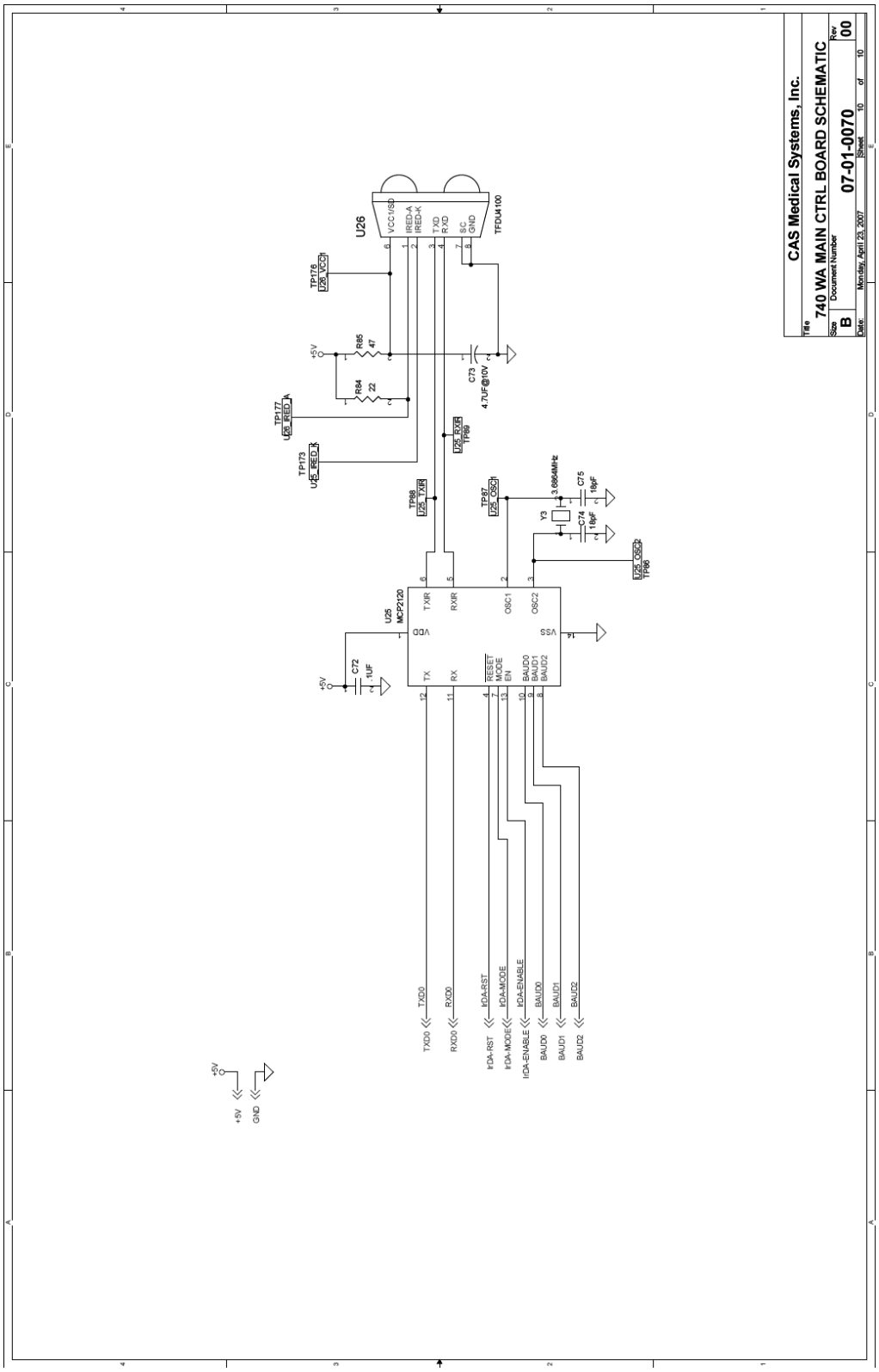
Page 8 of 12

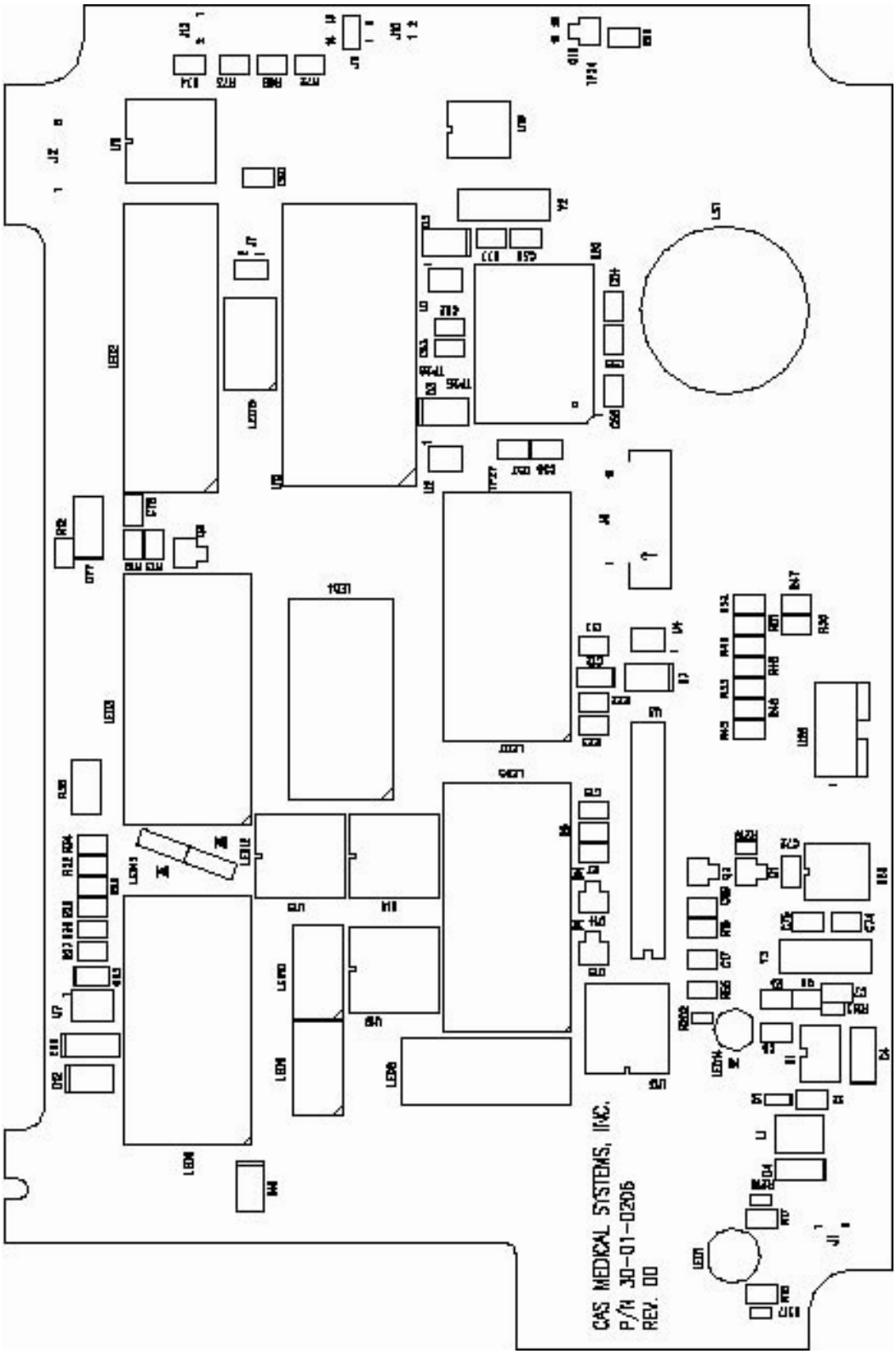

CAS Medical Systems, Inc.
740 WA MAIN CTRL BOARD SCHEMATIC
07-01-0070
00
DSP56F827
LEDS
LED 8 CHARACTERS DISPLAY
SWITCHES
AUDIO
SERIAL PORTS
SPI PORT
IrDA
JTAG
SSI
RTC
U21 SNAPHAT M4T28-BR12SH 14-01-0005
Not Installed

Page 9 of 12

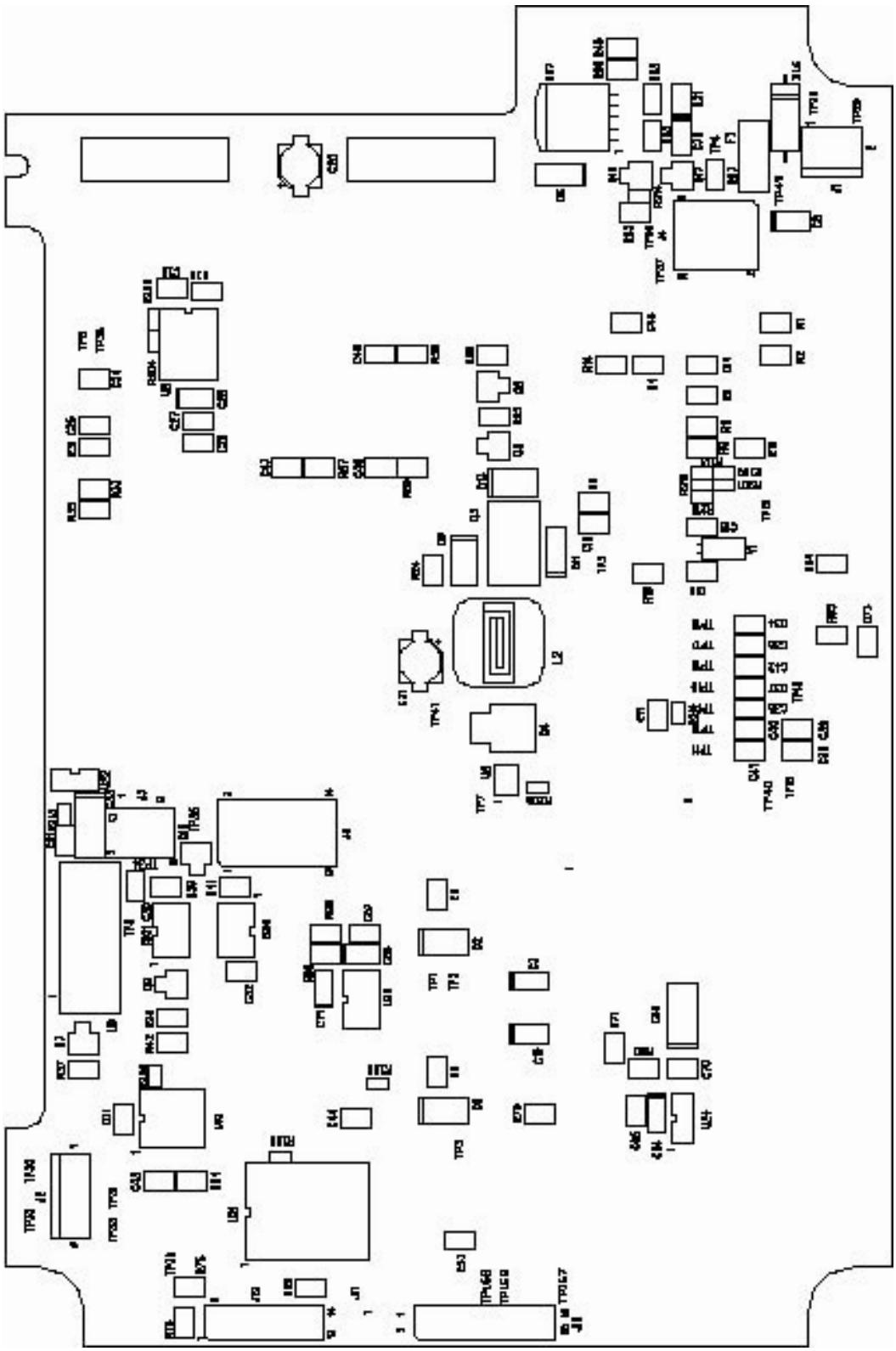

CAS Medical Systems, Inc.
740 WA MAIN CTRL BOARD SCHEMATIC
07-01-0070
00
SPEAKER
LS1
U24 LM386
U23 LM1971
C55 1UF
C84 10UF@10V
C68 220UF@16V
C70 .047UF
R80 10
C87 1UF
C86 10UF@10V
C71 1UF@25V
R98 100K 1%
R99 10K 1%
TP93 U25_AUDIN
TP95 AUD_ATTEN
TP200 AUDIO-IN
TP178 AUDIO-ENABLE
TP94 U24_AUDOUT
U24_RC
TP92
U23_AUD_OUT
TP84
+5V
+3.3V
AGND
MISO
MOSI
SCLK

Page 10 of 12

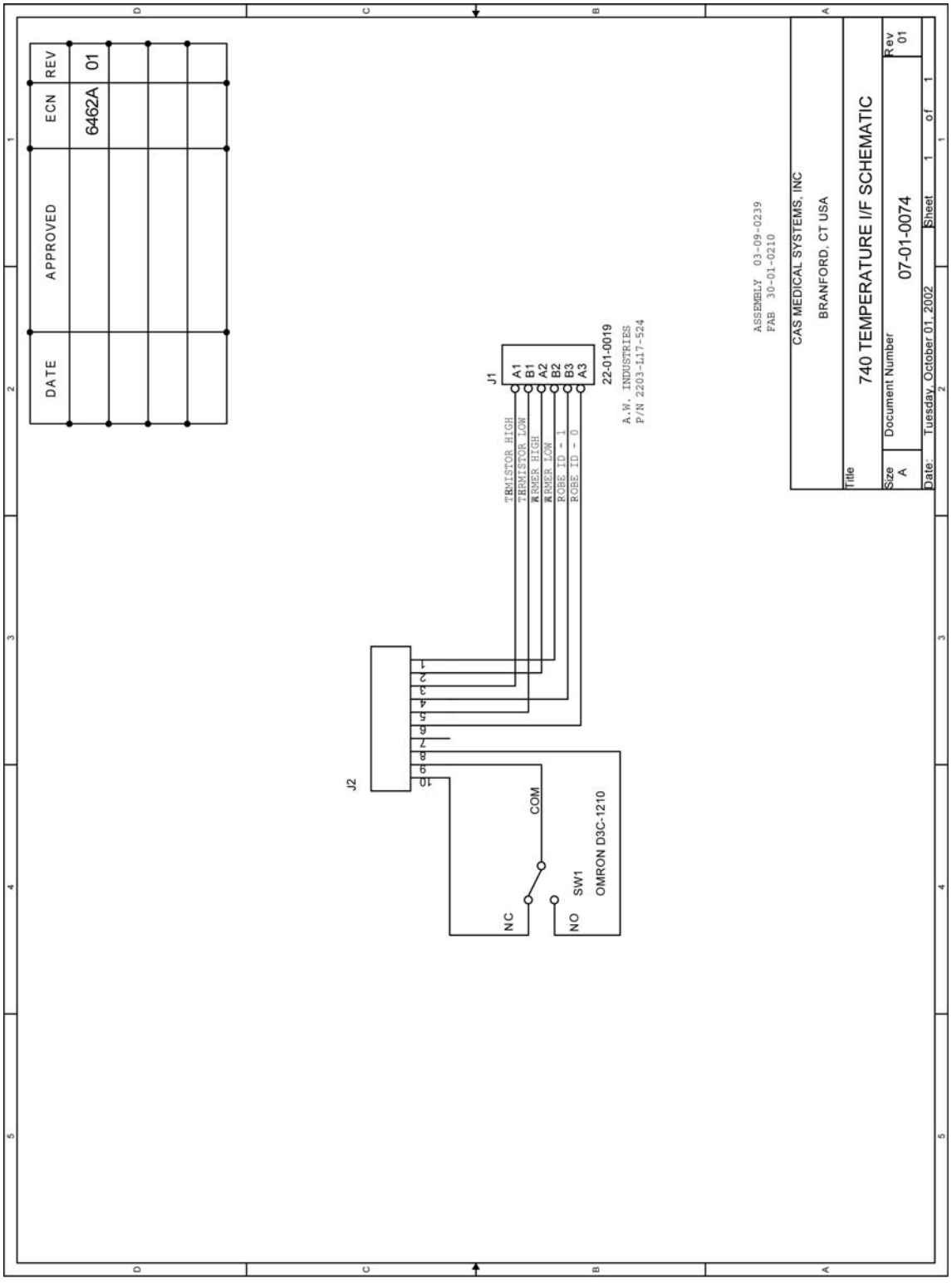

CAS Medical Systems, Inc.
740 WA MAIN CTRL BOARD SCHEMATIC
07-01-0070
Rev 00
Size B
Monday, April 23, 2007
Sheet 10 of 10
U26
TFDU4100
VCC1/SD
IRED-A
IRED-K
TXD
RXD
SG
GND
TP178
U26_VCC1
R85
47
R84
22
C73
4.7UF@10V
TP177
U26_IRED_A
TP173
U26_IRED_K
U25_RXR
TP69
TP88
U25_TXR
TP87
U25_OSC1
3.6864MHz
Y3
C75
18pF
C74
18pF
U25_OSC2
TP68
U25
MCP2120
TXIR
RXIR
OSC1
OSC2
VDD
VSS
C72
1UF
TX
RX
RESET
MODE
EN
BAUD0
BAUD1
BAUD2
TXD0
RXD0
IrDA-RST
IrDA-MODE
IrDA-ENABLE
BAUD0
BAUD1
BAUD2
+5V
GND


CAS MEDICAL SYSTEMS, INC.
P/N 30-01-0206
REV. 00

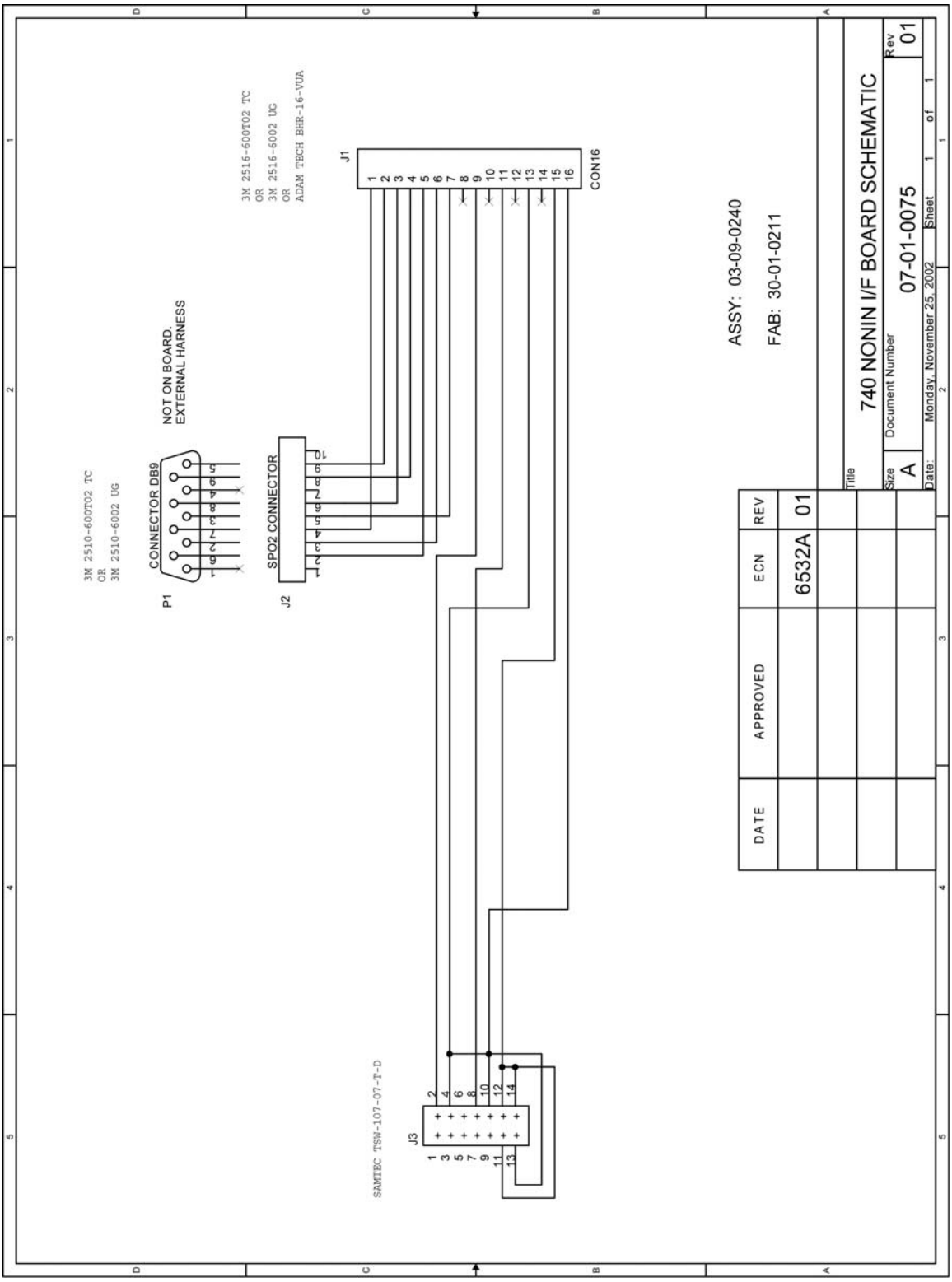
Page 12 of 12



TEMPERATURE INTERFACE BOARD

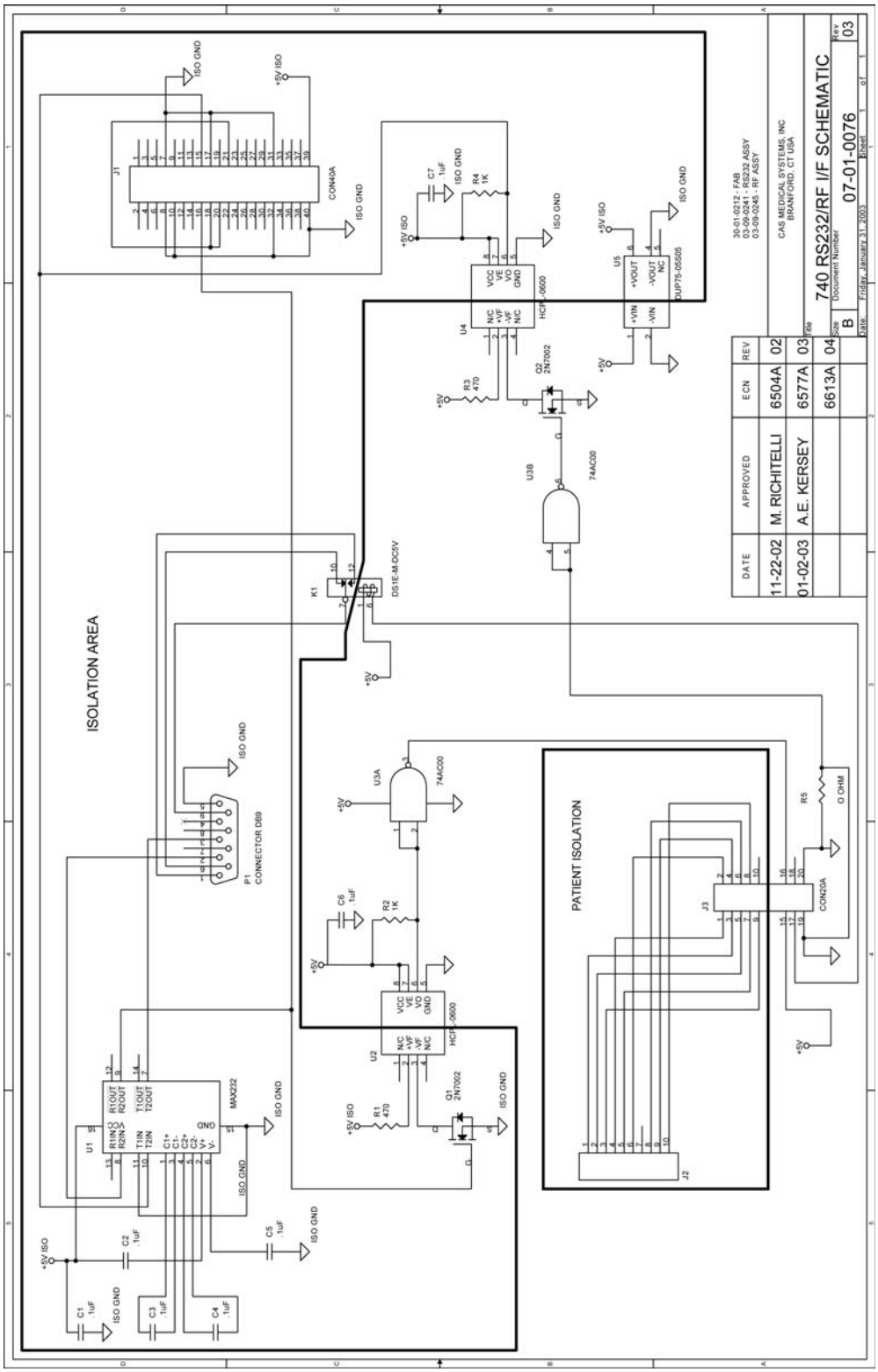


NONIN INTERFACE BOARD

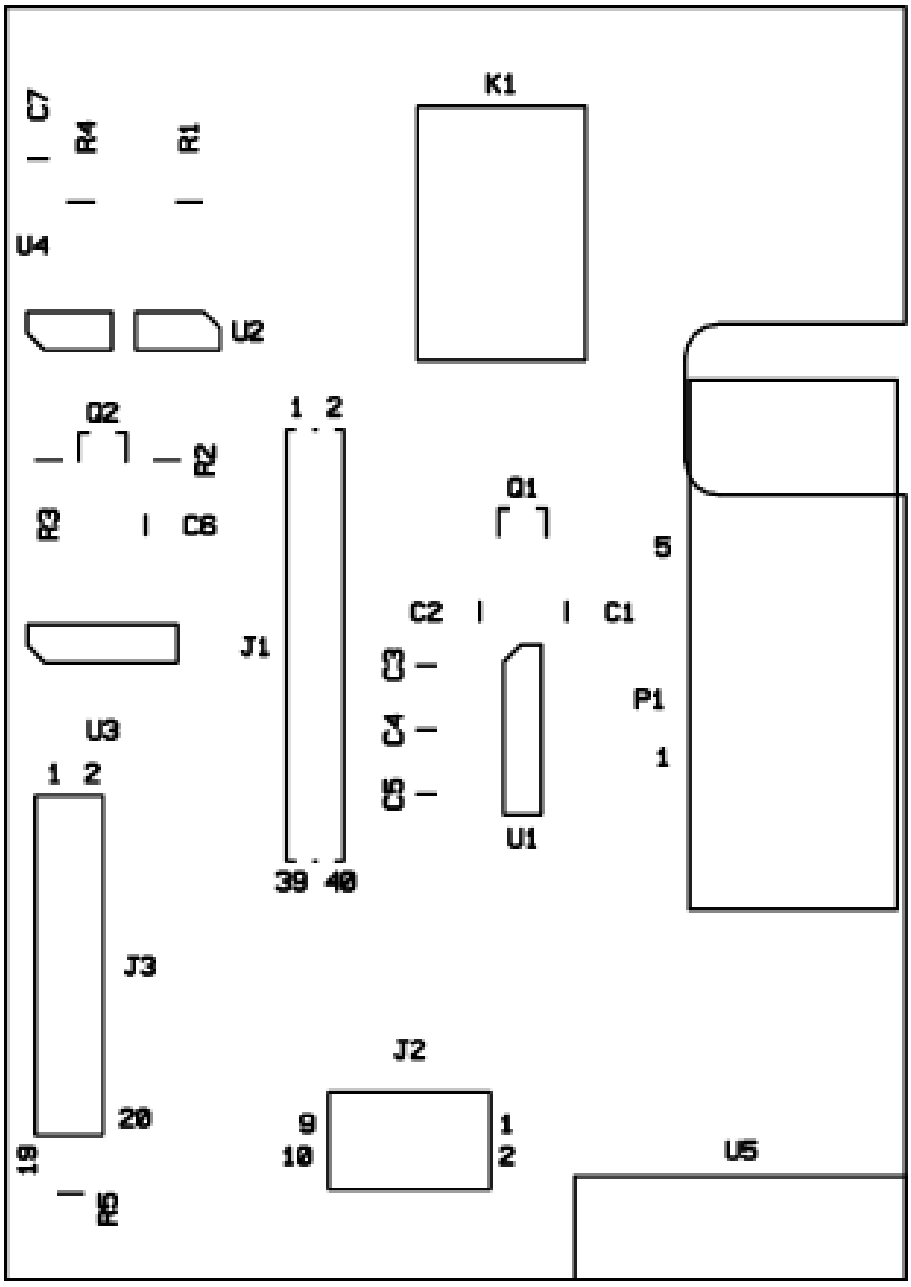


RS 232/NURSE CALL INTERFACE BOARD

Page 1 of 2

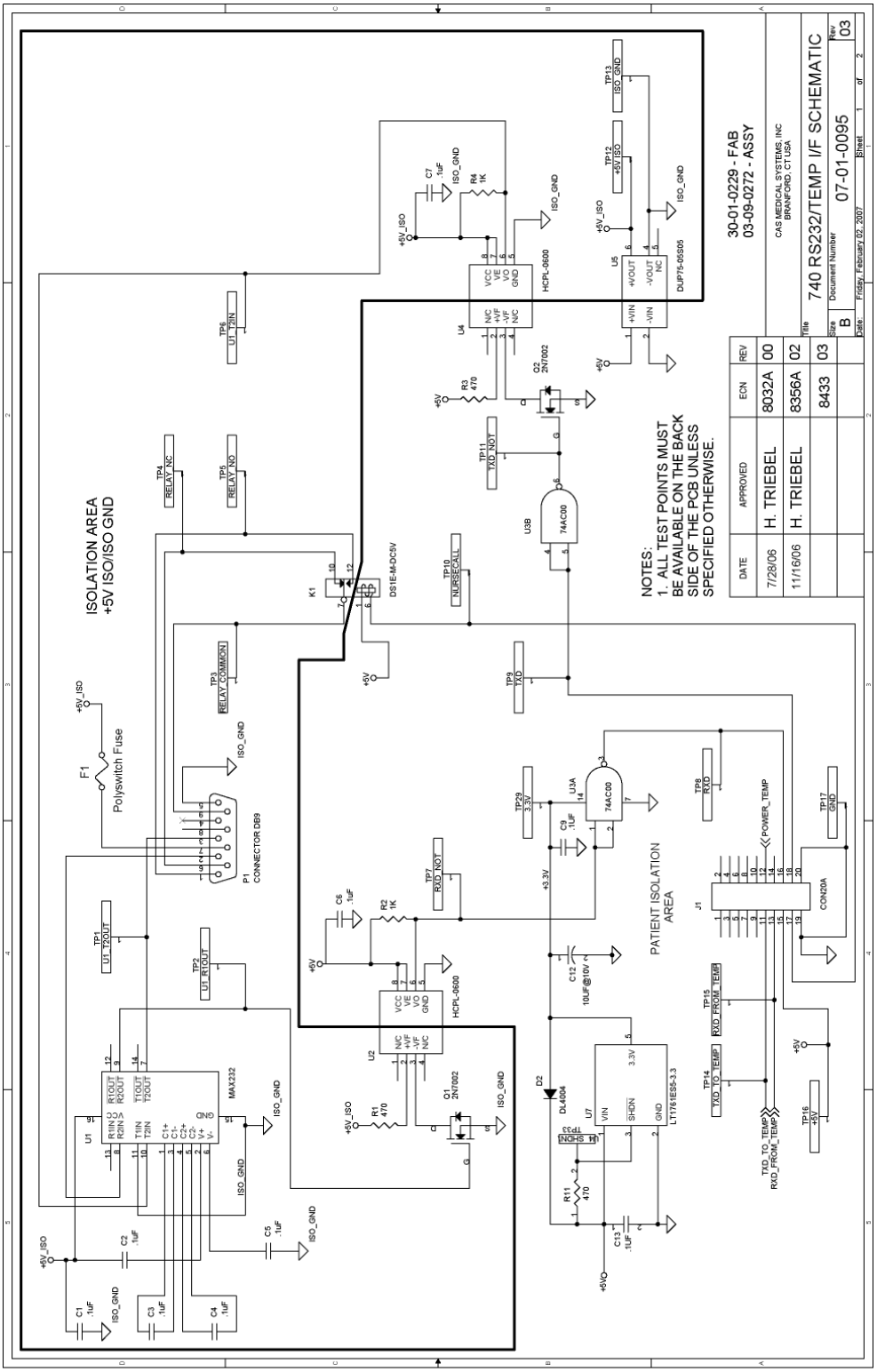


Page 2 of 2

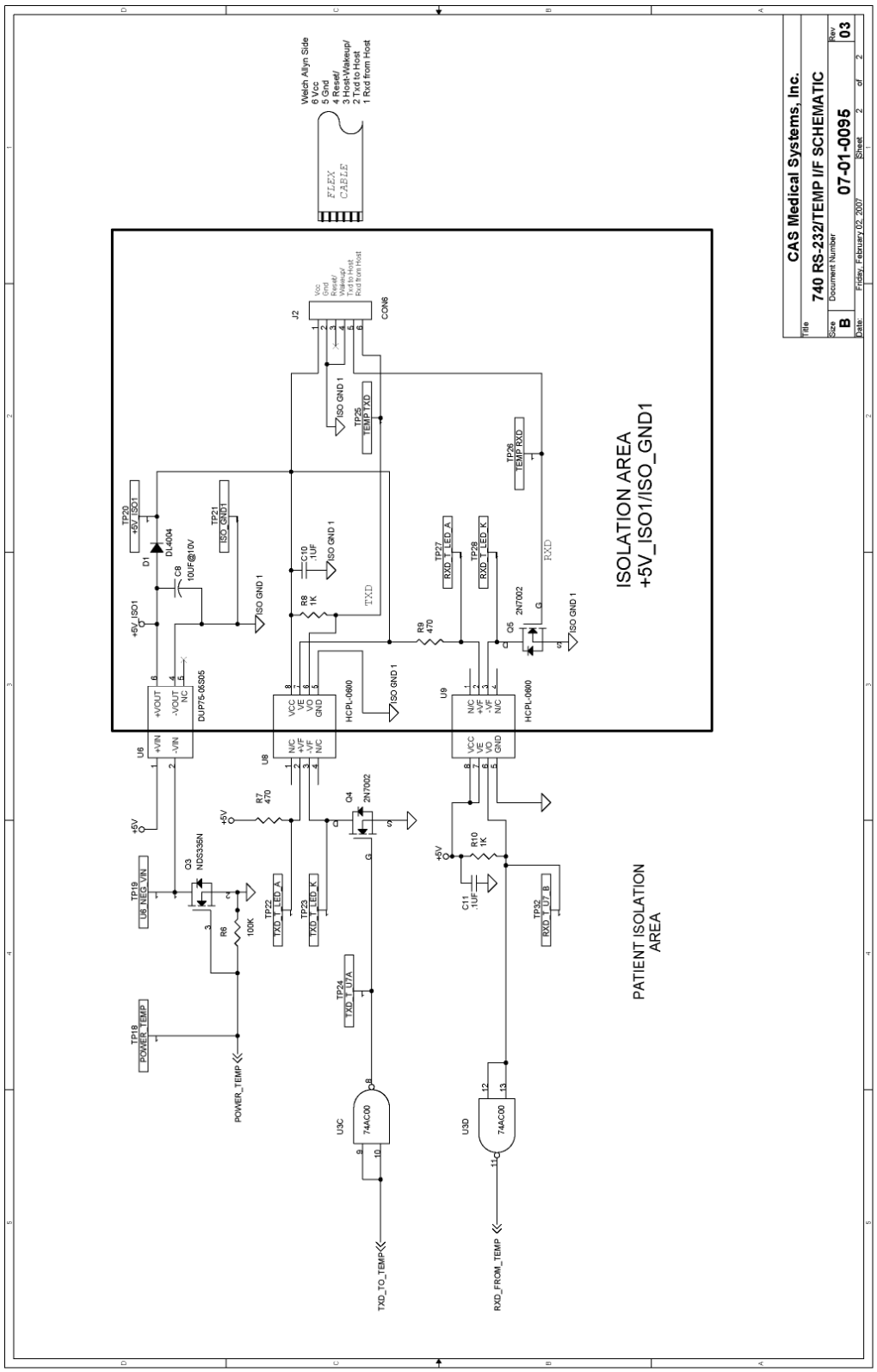

K1
C7
R4
R1
U4
U2
Q2
R2
R3
C6
1 2
Q1
5
C2
C1
J1
C3
C4
C5
P1
1
U3
1 2
U1
39 40
J3
20
19
R5
J2
9
10
1
2
U5

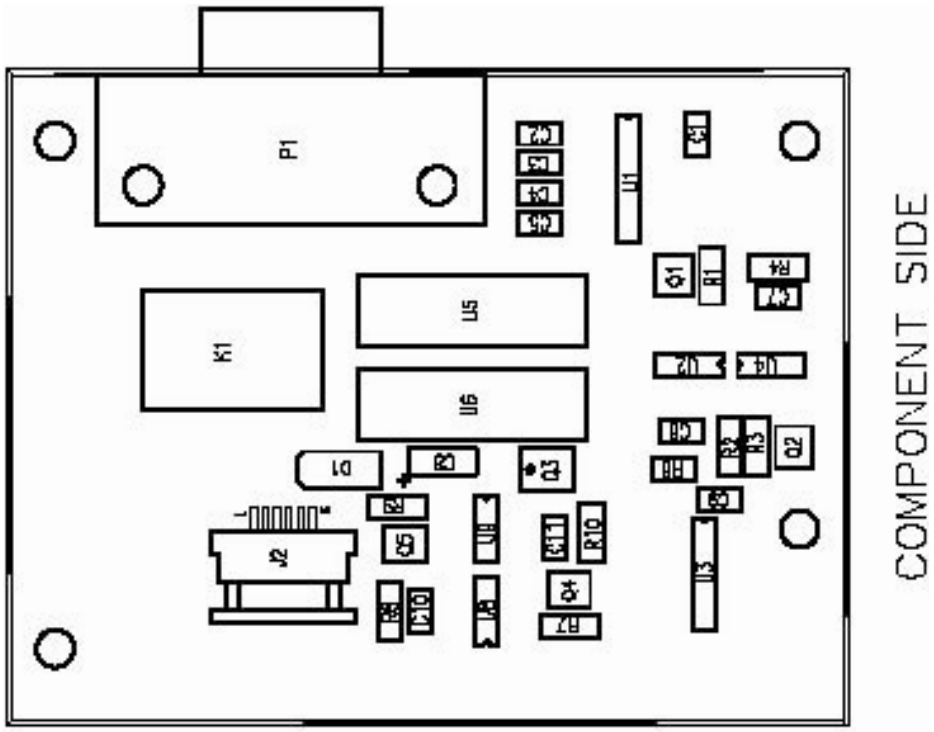
RS 232/NURSE CALL INTERFACE BOARD (SureTemp® Plus)

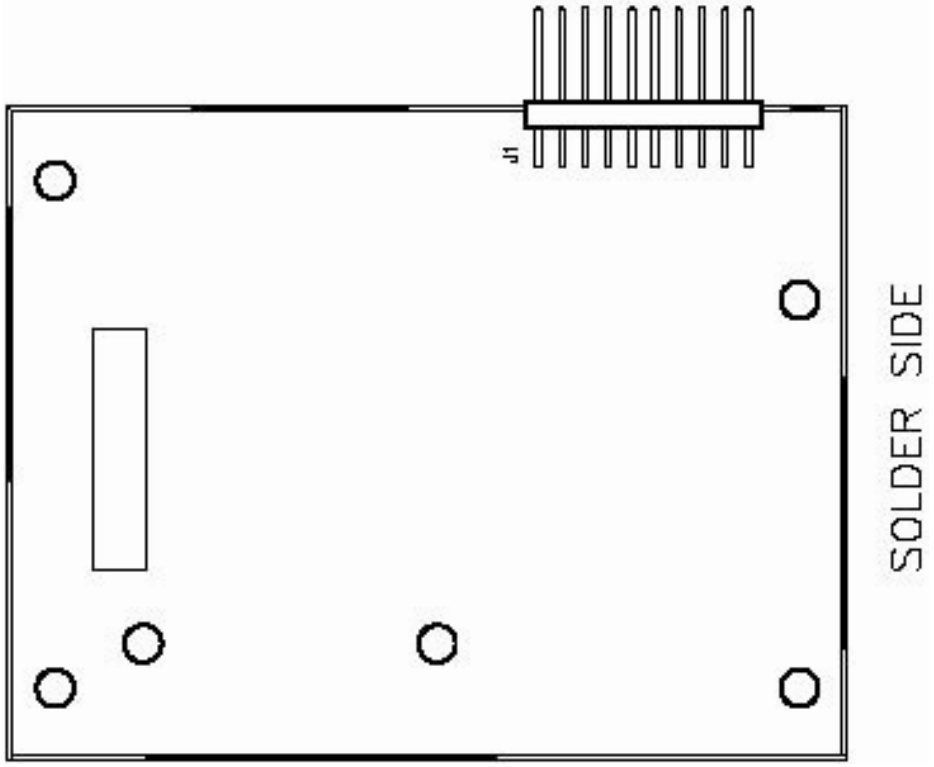
Page 1 of 3



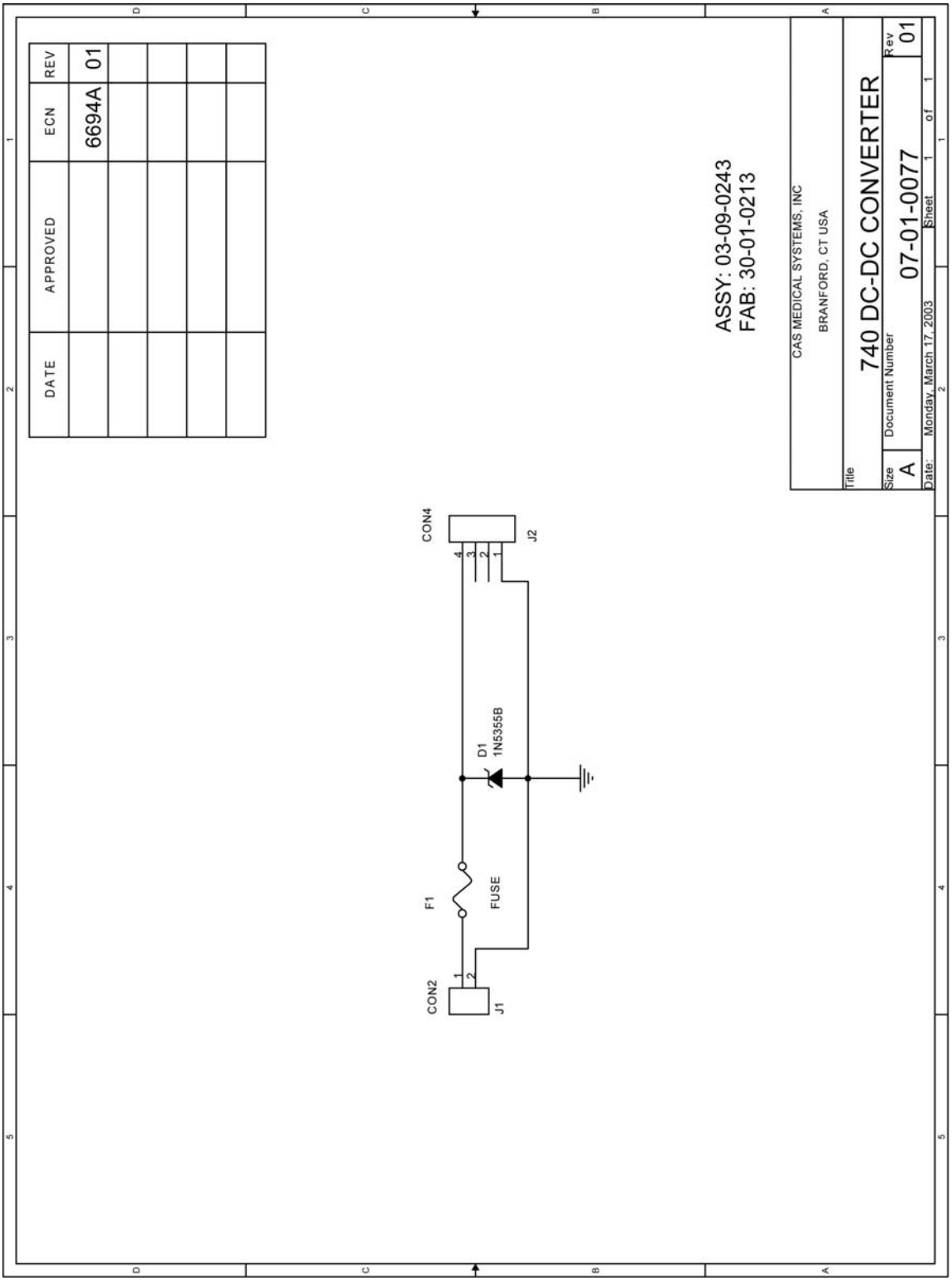
Page 2 of 3


CAS Medical Systems, Inc.
740 RS-232/TEMP I/F SCHEMATIC
07-01-0095
Rev 03
Size B
Friday, February 02, 2007
Sheet 2 of 2
Welch Allyn Side
6 Vcc
5 Gnd
4 Reset/
3 Host-Wakeup/
2 Txd to Host
1 Rxd from Host
FLEX CABLE
J2
CON6
ISOLATION AREA
+5V_ISO1/ISO_GND1
PATIENT ISOLATION AREA
ISO GND 1
+5V_ISO1
TP20 +5V_ISO1
TP21 ISO_GND1
D1 DL4004
C8 10UF@10V
C10 .1UF
R8 1K
R9 470
TP25 TEMP_TXD
TP26 TEMP_RXD
TP27 RXD_LED_A
TP28 RXD_LED_K
Q5 2N7002
RXD
TXD
U6 DUP75-05S05
U8 HCPL-0600
U9 HCPL-0600
R7 470
Q4 2N7002
+5V
C11 .1UF
R10 1K
TP19 U6_NEG_VIN
C3 NDS356N
R6 100K
TP22 TXD_T_LED_A
TP23 TXD_T_LED_K
TP24 TXD_T_U7A
TP32 RXD_T_U7_B
TP18 POWER_TEMP
POWER_TEMP
U3C 74AC00
U3D 74AC00
TXD_TO_TEMP
RXD_FROM_TEMP


P1
K1
U5
U6
L1
D1
Q3
Q2
U1
J2
J1
COMPONENT SIDE


J1
SOLDER SIDE

DC CONVERTER BOARD



PROPRIETARY BOARDS

Due to the proprietary nature of the Power Supply Board from Condor, the SpO_2 Boards from Masimo, Nellcor and Nonin, and the Temperature Boards from Welch Allyn, the schematics, board layouts and bill of materials could not be placed into this service manual.

Contact Condor, Masimo, Nellcor, Nonin and Welch Allyn directly for this information.

14. SPARE PARTS

PRINTED CIRCUIT BOARDS

Part Number	Description
03-09-0243	DC Input Board, 740M
03-09-0235	Main Control Board, SureTemp® Plus (Need to provide complete model number and serial number when ordering)
03-09-0262	Main Control Board (Need to provide complete model number and serial number when ordering)
03-09-0263	Main Control Board, 740-1
28-02-0419	Masimo SpO_2 Board
03-08-0614	ND+ NIBP Module
28-02-0424	Nellcor SpO_2 Board
28-02-0106	Nonin SpO_2 Board
11-01-0057	Power Supply Board
03-09-0241	RS232 / Nurse Call Interface Board
03-09-0272	RS232 / Nurse Call Interface Board, SureTemp Plus
03-09-0239	Temperature Interface / Switch Board
28-02-0109	Welch Allyn Temperature Board
28-02-0483	Welch Allyn Temperature Board, SureTemp Plus

SWITCHES/CONTROLS/CONNECTORS

Part Number	Description
21-06-0015	Membrane Keyswitch Panel
21-06-0031	Membrane Keyswitch Panel with English Text
27-03-0094	NIBP Input Connector
22-01-0271	Power Entry Module with Line Filter
22-01-0289	Power Entry Module used with Ground Lug (>7/04)

CABLES

Part Number	Description
18-02-0220	Control Board to Battery Harness
18-02-0228	Internal Power Cbl, 740M
18-02-0225	Masimo SpO_2 Input Cable
18-02-0226	Nellcor to Main Control Board I/F Cable
18-02-0224	Nellcor SpO_2 Input Cable
18-02-0222	Nonin SpO_2 Input Cable
18-02-0219	Supply to Main Control Board Harness

MISC PARTS

Part Number	Description
23-01-0118	Battery Harness Plate
29-01-0300	Case, Front with SpO_2 window
29-01-0294	Case, Front without SpO_2 window
29-01-0295	Case, Rear
29-01-0301	Case, RS232 Module
29-01-0302	Case, Temperature Module
29-01-0326	Case, Temperature Module, SureTemp® Plus
29-01-0328	Cover, Temperature Module, SureTemp Plus
14-01-0005	Clock Battery
28-02-0422	Foot Pad
09-01-0002	Fuse (250V, 500mA, 5 x 20mm, Slow Blow), 2 per monitor. Refer to the monitor's rear panel labeling for actual fuse rating.
09-01-0008	Fuse, 3.15 Amp, Time-Lag, 740M
09-01-0034	Fuse (250V, 1.25A, 5 x 20mm, Slow Blow), 2 per monitor. Refer to the monitor's rear panel labeling for actual fuse rating.
28-02-0433	Gasket, Side Module
28-02-0482	Gasket, Side Module, SureTemp® Plus
29-01-0299	IR Window
21-01-1317	Label Set
21-01-1746	Label Set, SureTemp® Plus Module
01-02-0248	Pressure Cylinder, 500 mL
29-01-0298	Sensor Connector Panel, Masimo and Nellcor
29-02-0020	Sensor Connector Panel, Nonin
24-04-0007	Speaker
01-02-0095	SureTemp® Calibration Key
01-02-0455	SureTemp® Plus Calibration Key

15. SPECIFICATIONS

NIBP MEASUREMENT

Characteristic	Specification	
Technique:	Oscillometric (MAX NIBP® Technology) Microprocessor software eliminates most ambient noise and motion artifact.	
Patient Range:	Neonate – Adult	
Blood Pressure Range	NEO	ADULT
Systolic:	30 – 135 mmHg	30 – 255 mmHg
Diastolic:	15 – 110 mmHg	15 – 220 mmHg
MAP:	20 – 125 mmHg	20 – 235 mmHg
Pulse Rate Range:	40 – 240 BPM	30 – 240 BPM
Accuracy		
Blood Pressure:	+/-5 mmHg with a standard deviation no greater than 8 mmHg (See Standards)	
Pulse Rate:	+/-2% or +/-2 BPM, whichever is greater	

OXIMETRY (OPTIONS)

Characteristic	Specification	
Nonin®		
Type:	Functional Oxygen Saturation	
SpO_2 % Range:	0 - 100%	
SpO_2 Accuracy:	Sensor 8000AA 8000AP 8000K2	Accuracy 70 - 100%, +/-2 digits (1 S.D.)
	Sensor 8000J 8000R	Accuracy 70 - 100%, +/-3 digits (1 S.D.)
	Sensor 8000Q	Accuracy 70 - 100%, +/-4 digits (1 S.D.)
Measurement Wavelengths:	Red 660 nanometers	
	Infrared 910 Nanometers	
Power:	3 mW nominal	
Pulse Rate Range:	18 - 240 BPM	
Pulse Rate Accuracy:	+/-3% or +/-1 digit, whichever is greater	
Numerics:	Updated every one (1) second.	

NOTE:
For further information on sensors and sensor accuracy, contact Nonin.

Characteristic	Specification
Masimo SET®	
Type:	Functional Oxygen Saturation
SpO_2 % Range:	0 - 100%
SpO_2 Accuracy:	Sensor — Accuracy DC-195, LNOP® Adt, LNOP DCI, LNOP DCSC, LNOP DC1P, LNOP DC150, LNOP Pdt, LNOP Y-1, LNOPv Ad — 70 - 100%, +/-2 digits (1 S.D.)
	Sensor — Accuracy LNOP Neo, LNOP Neo Pt — 70 - 100%, +/-3 digits (1 S.D.)
	Sensor — Accuracy LNOP EAR — 70 - 100%, +/-3.5 digits (1 S.D.)
Measurement Wavelengths:	Red 660 Nanometers
	Infrared 905 Nanometers
Power:	Maximum radiant power at 50 mA pulsed is 0.79mW
Pulse Rate Range:	25 - 240 BPM
Pulse Rate Accuracy:	+/-3 BPM
Numerics:	Updated every one (1) second.

NOTE:
For further information on sensors and sensor accuracy, contact Masimo.

Characteristic	Specification
Nellcor® OxiMax®	
Type:	Functional Oxygen Saturation
SpO_2 % Range:	1 - 100%
SpO_2 Accuracy:	Sensor — Accuracy MAX-A — 70 - 100%, +/-2 digits (1 S.D.) MAX-AL MAX-N (Adult) MAX-P MAX-I MAX-FAST SC-A (Adult)
	Sensor — Accuracy OxiCliq A — 70 - 100%, +/-2.5 digits (1 S.D.) OxiCliq I OxiCliq N (Adult) OxiCliq P
	Sensor — Accuracy DS-100A — 70 - 100%, +/-3 digits (1 S.D.) D-YS (Infant to Adult) MAX-N (Neonate) OXI-A/N (Adult) OXI-P/I SC-NEO (Neonate) SC-PR (Neonate)
	Sensor — Accuracy D-YS — 70 - 100%, +/-3.5 digits (1 S.D.) D-YSE D-YSPD OxiCliq N (Neonate)
	Sensor — Accuracy MAX-R — 80 - 100%, +/-3.5 digits (1 S.D.)
	Sensor — Accuracy D-YS (Neonate) — 70 - 100%, +/-4.0 digits (1 S.D.) OXI-A/N (Neonate)
Measurement Wavelengths:	Red 660 Nanometers
	Infrared 890 Nanometers
Power:	Not exceeding 15 mW
Pulse Rate Range:	20 - 240 BPM
Pulse Rate Accuracy:	+/-3 digits
Numerics:	Updated every one (1) second.

NOTE:
For further information on sensors and sensor accuracy, contact Nellcor.

TEMPERATURE (OPTIONAL)

Characteristic	Specification
Temperature Range:	28.9 to 42.2 °C (84.0 to 108.0 °F)
Accuracy:	+/-0.1°C (+/-0.2°F), Meets or exceeds ASTM Standards

PATIENT ALARMS

CASMED 740 with NIBP

Patient Parameter	Neonatal Limit Range		Adult Limit Range	
	Low	High	Low	High
SYS	35 – 130	35 – 130	35 – 250	35 – 250
DIA	20 – 105	20 – 105	20 – 215	20 – 215
MAP	25 – 120	25 – 120	25 – 230	25 – 230
Pulse	45 – 235	45 – 235	35 – 235	35 – 235

CASMED 740 with NIBP and SpO_2

Patient Parameter	Neonatal Limit Range		Adult Limit Range	
	Low	High	Low	High
SYS	35 – 130	35 – 130	35 – 250	35 – 250
DIA	20 – 105	20 – 105	20 – 215	20 – 215
MAP	25 – 120	25 – 120	25 – 230	25 – 230
%SpO_2	70 – 95	80 – 99	70 – 95	80 – 99
Pulse	25 – 235	25 – 235	25 – 235	25 – 235

NOTE:
Each alarm limit may also be selected “OFF” individually or as a whole.
Low Limits cannot be set above the associated High Limit.
High Limits cannot be set lower than the associated Low Limit.

CONTROL PANEL

Characteristic	Specification
Display:	LED display of measurement results, instructions, troubleshooting messages and signal strength bar.
Parameters Displayed:	Systolic Pressure, Diastolic Pressure and Mean Arterial Pressure (MAP)
	Pulse Rate
	%SpO_2
	Temperature (in Fahrenheit or Celsius)

SAFETY LIMITS

Characteristic	Specification
Automatic Cuff Deflation:	If cuff pressure exceeds 290 mmHg (Adult); 145 mmHg (Neonate)
	If measurement time exceeds 120 seconds (Adult), 90 seconds (Neonate)
	If safety timer detects microprocessor failure

OPERATING MODES

Characteristic	Specification
Patient:	NIBP function in Neonatal or Adult
NIBP:	Manual, STAT or Automatic (at preset intervals)
History:	Review of previous measurements
%SpO_2:	Continuous Monitoring
Temperature:	Predictive or Continuous Monitoring

POWER

Characteristic	Specification
Source:	External line or internal battery
AC Power:	100 - 240 VAC, 50/60 Hz, 0.5A; Fuse Rating – T500mAL250V or T1.25AL250V (two provided). Refer to rear panel monitor labeling for actual fuse rating.
DC Power (EMS Option):	+12 VDC; 7W; Fuse Rating – Wickman Type TE5, Time Lag, 3.15A, 125VAC or approved equivalent (one provided)
Battery:	Nickel Metal Hydride (NiMH) battery pack (user removable)
	Charge Time: 4 hours
	Operation on battery: 100 NIBP readings when set in the 5-minute Automatic Mode
Leakage Current:	100 microamp (maximum)

FEATURES

Characteristic	Specification
Self Test:	System self test is performed each time power is turned on.
Auto Zero:	Zero pressure reference is automatically established after every reading.
Inflation:	Initial inflation to 150 mmHg (Adult) or 85 mmHg (Neonatal) or user selectable. (80, 100, 120, 140, 150, 160, 180, 200) - Adult ; (60, 80, 85, 100, 120) - Neonatal. Subsequent inflation to approximately 30 mmHg greater than previous Systolic pressure.
Deflation:	Automatic
Max Measurement Time:	Limited to 120 seconds (Adult), 90 seconds (Neonate)

OPERATING ENVIRONMENT

Characteristic	Specification
Operating Temperature:	0°C to 50°C (32°F to 122°F)
Humidity:	15 to 95%, non-condensing
Altitude:	10,000 to –1,000 ft (690 – 1050 hPa)

Monitors may not meet performance specifications if stored or used outside temperature and humidity ranges. When moving the monitor from a storage location, wait at least one-hour prior to use to allow the monitor to adjust to room temperature.

STORAGE/TRANSPORT ENVIRONMENT

Characteristic	Specification
Storage / Transport Temperature:	-20°C to 60°C (-4°F to 140°F)
Humidity:	15 to 95%, non-condensing
Altitude:	10,000 to –1,000 ft (690 – 1050 hPa)

PHYSICAL DIMENSIONS & WEIGHT

Characteristic	Specification
Base Unit	
H x W x D:	6.75 in x 8.5 in x 3.0 in
	(17 cm x 21.5 cm x 7.5 cm)
Weight:	3 lbs approx. (1.4 kg)

SERIAL INTERFACE

Characteristic	Specification
Interface:	Bi-directional serial communication
Speed:	9600 for Printer 115200 for CAS Serial Protocol
Signal Level:	RS232C
Data Length:	8 bits
Start Bit:	1 bit
Stop Bit:	1 bit
Parity:	None
Flow Control:	None

NURSE CALL INTERFACE

Characteristic	Specification
Relay contacts:	Floating, one opening and one closing contacts
Max. Switch Power:	0.3 A at 120 VAC or 1.0 A at 30 VDC
Max. Delay	Less than 0.5 seconds

OPTIONAL ACCESSORIES

Infrared Printer
Swiveled Hard Mount (for ambulance applications)
Roll Stand and Basket
Protective Carrying Case

STANDARDS

Accuracy complies with that given in American National Standard for Electronic or Automated Sphygmomanometers, ANSI/AAMI SP10, 2002. Adult blood pressure measurements determined with this device are equivalent to those obtained by an auscultatory blood pressure measurement device and neonatal ones are equivalent to those obtained by an intra-arterial blood pressure device, within the limits prescribed by the American National Standard for Electronic or Automated Sphygmomanometers. The 4th Korotkoff sound was used to determine Diastolic pressure. Study findings are available.

Units comply with the following requirements:

IEC 60601-1
EN 60601-1-2
IEC 865
IEC 60601-2-30
IEC 60601-2-49
ETL Listed - UL 2601, CAN/CSA C22.2 No.601.1
CE marking according to Directive 93/42/EEC

Possession or purchase of this device does not convey any express or implied license to use the device with replacement parts which would, alone, or in combination with this device, fall within the scope of one or more of the patents relating to this device.

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CASMED®, MAXNIBP®, Tuff-Cuff®, Safe-Cuff®, Pedisphyg® and "*FOR WHAT'S VITAL*" are registered trademarks of CAS Medical Systems, Inc.

All units covered by U.S. patent 4,796,184 and 5,022,403. Other patents pending.

Monitors are CE marked.